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ABSTRACT

Two papers comprising Block II of a course in economics and education policy are presented along with a conclusion to Block I and II of the series published by the Open University. The first paper, "Education as a Social Investment," by Vera Morris, focuses on such areas as the identification of costs and benefits, the return on the social investment, and implications of the rates of return for policy. Objectives listed for the course include an understanding of a social cost-benefit study in education and the main assumptions underlying social rates of return. Fourteen self-assessment questions appear throughout the text, and the answers are provided at the conclusion of the section. The second paper, "Manpower Planning and the Demand for Qualified Manpower," by Maureen Woodhall, explores aspects of manpower forecasting with emphasis on the demand trends in science, engineering, and teaching. Among objectives listed are the ability to state the major assumptions of manpower forecasting and to decide on what basis manpower forecasts ought to be evaluated. Five self-assessment questions appear throughout the text, and the answers are provided at the conclusion of the section. Adam Westoby summarizes the six papers presented in the two blocks of the course. (PHP)

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ED 322 Block II

THE OPEN UNIVERSITY

Educational Studies and Social Sciences: A Third Level Course

Economics and Education Policy II

The Planning of Higher Education
The Social Demand

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THE OPEN UNIVERSITY

Educational Studies and Social Sciences: A Third Level Course
Economics and Education Policy II

The Planning of Higher Education
The Social Demand

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by Vera Morris

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by Maureen Woodhall

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by Adam Westoby

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1.1

Note on reading

Set reading

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For specific reference to material used in the text, see the section 'Notes and References' at the back of this volume.

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Paper 1

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Paper 2

Extract from M. Blaug, M. Peston and A. Ziderman, *The utilization of educated manpower in industry*, Edinburgh, Oliver & Boyd, 1967, reprinted by permission of The London School of Economics and Political Science; *Table 12* OECD.

PAPER 1

EDUCATION AS A SOCIAL INVESTMENT

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prepared by Vera Morris

Objectives

At the end of this paper you should be able to:

- understand what is meant by a social cost–benefit study in education;
- identify and critically evaluate both the cost and benefit components of such a study;
- describe the method used to estimate social rates of return;
- analyse and explain differences in social rates of return;
- interpret the economic-policy consequences of estimated rates of return;
- understand the main assumptions underlying social rates of return;
- assess the kind of adjustments that may have to be made to both cost and benefit data before social rates of return can be calculated;
- identify the empirical evidence on social rates of return in the UK;
- assess the resource implications of social rates of return in the light of objectives for education policy other than economic ones.

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1 Introduction

Social rates of return

1.1 You will now be familiar with the idea that educational expenditure is a form of investment. This concept has so far been explored in particular from the point of view of the individual deciding whether or not to continue in education. You are also familiar with the idea that this involves evaluating the costs and benefits associated with different courses, and calculating a 'private rate of return'. The profitability of investments by society can be measured using techniques similar to those described in measuring the profitability of individuals' investments. In this paper we are interested in analysing these *social rates of return* rather than the *private rates of return*. You will find that because a similar technique is used to identify and measure both the private and the social rates of return, and because similar sources of data are used, there is a certain amount of apparent repetition. But you will also find, because we are here concerned with identifying and measuring community-wide costs and benefits, that the specific items which are included as costs and benefits differ. Thus a wider cost–benefit framework is adopted for analysing returns on investment in education to society than for returns to the individual, and for this reason the private and social returns diverge.

1.2 Education is largely financed through public expenditure, and this explains one of the main reasons for analysing the consequences of educational investment by society. The use of the term 'society' indicates that all sections and groups in the community—as well as those individuals benefiting from additional education—are included in the analysis.

A cost–benefit framework

1.3 Because we are here investigating the use of a cost–benefit framework to evaluate the benefits to society from investment in education it is useful to identify and measure these benefits in *monetary terms*—where possible. The method involves a systematic comparison of monetary values of the benefits, along with the costs of provision, using the discounted cash-flow technique you are already familiar with to estimate the rates of return.

1.4 The *social benefits* are estimated by the increase in national production resulting from more qualified manpower, measured by the pre-tax earnings differentials associated with additional education (the benefits to the individual were calculated from the after-tax lifetime earnings differentials). The *social costs* include all the monetary values of resources used by teaching institutions, including administrative, overhead, and capital costs, as well as production forgone by students not in the labour force. By contrast private costs include only those borne directly by the student such as tuition fees and forgone earnings.

1.5 We shall return to a more detailed discussion of the differences between social and private rates of return later, but let us note for the moment that there are considerable problems in identifying and measuring the effects of social investment in monetary terms—partly because education is not marketed and the effects of educational expenditure are not therefore directly reflected in market prices. So valuations depend on proxy measures. On the other hand these problems are not unique to education, but are common to many other areas of public expenditure where reliable indicators of the demand for investment are not produced by the pricing system.

1.6 Cost–benefit analysis is a method which has often been used for assessing the economic value of public expenditure projects, and has most often been used in circumstances where the price charged for a service cannot appropriately reflect the demand for it. For example road-users cannot bid up the money price of road use in particular locations because they are not charged a price reflecting conditions on that particular road:[1] or to take another example, local conditions may be such that a new urban public-transport scheme relieves some road congestion, thereby saving the time of travellers on existing routes. There is no direct price for this time saved, but it may be possible to find an imputed monetary value for it.

1.7 So cost–benefit analysis has been used in situations where costs and benefits do not necessarily have a direct money price but where a monetary value can be found which enables them to be summed with other items which *are* priced.

1.8 Of course not everything can be given a satisfactory proxy monetary value: this is as true in other sectors of the economy as it is in education. Even where environmental factors such as noise, vibration, air pollution, visual intrusion and community disruption can be measured physically and taken into account as far as possible in reaching decisions, it has not as yet proved possible to find a satisfactory monetary value for the effects of such decisions.

1.9 Cost–benefit analysis is essentially a practical tool for decision-making; it is a way of setting out the factors that need to be taken into account in making economic choices. Most of the choices to which it has been applied involve decisions about whether or not a particular project is worth while; which is the best of several alternative projects; and when to undertake a particular project. As generally understood, it is a technique for taking decisions within a framework, which has been decided upon in advance, and which involves a wide range of considerations, many of which may be of a political or social character. So it is a method of analysis which is unlikely to be useful in decisions about large-scale investments, which might themselves cause changes in the relative price structure on which cost–benefit analysis is itself based. For example, raising the school-leaving age may significantly alter the relative wages structure of the labour market for young people, and thus the costs and benefits of staying on at school.

Social rates of return in a policy context

1.10 In this paper we are concerned with the use of cost–benefit analysis to the policy- or decision-maker. The main emphasis is on the practical application of this particular form of economic analysis to education policy. We shall first consider the main theoretical problems, and then look at the implications of the empirical evidence for policy-makers.

1.11 But first let us note that private and social rates of return may be useful to policy-makers in different ways. Private rates of return, as you have seen, can be useful in providing some guide to the direction in which student demand for additional education might move, for example in the choice of course, or subject, and also in providing empirical evidence relevant to the assumptions underlying the so-called 'social demand' for education.

1.12 Social rates of return, on the other hand, as we shall see, are most relevant to questions of resource allocation where the aim is to plan public expenditure by economic criteria. And although the results are unlikely to provide the decision-maker with conclusive answers they do, nevertheless, help to identify policy issues which might otherwise remain concealed, and indicate the relative costs and benefits involved in reallocating resources between different educational sectors.

The allocation problem

1.13 What particular issues in educational policy might cost–benefit analysis be useful in illuminating? Broadly speaking, two observations have stimulated analysis in this field. They are: that the *costs* of educational provision are large, so the monetary value of goods and services that have to be withdrawn from other uses to provide for educational facilities are very large; and that the *benefits* in terms of increased national production resulting from these educational expenditures, as reflected in the earnings differentials of those individuals benefiting from the extra education, are also large.

1.14 The policy issues can be grouped as follows:

(i) Resources for education have to be diverted from other uses (assuming limited total resources). These uses may include, for example, expenditure on building a new housing estate, building a new motorway or building a new hospital. The government therefore has to decide how to allocate its expenditure between these different policy options. In general, cost–benefit analysis has, as yet, been less well developed to deal with decisions of allocation between different social-policy areas such as housing, education and health, than in decisions relating to those parts of the public sector where goods are marketed, such as nationalized industries. Nevertheless cost–benefit analysis provides one method of helping governments to make choices between alternative forms of social expenditure.

(ii) Resources also have to be allocated between alternative uses within the education sector itself, and cost–benefit analysis is probably potentially of most use to policy questions of this nature; choices have to be made, for example, between expenditure on different levels of education, such as graduate and post-graduate provision; between expenditure on different types of courses, such as full-time and part-time, graduate and non-graduate courses; between expenditure on provision of places in different subjects—science, arts and medicine—and different institutions such as universities and polytechnics; and between different types of educational provision for men and women.

1.15 These kind of policy issues are mainly concerned with the efficient allocation of resources. For this reason cost–benefit analysis provides a convenient framework for asking whether the return society gets on an investment in education is sufficiently high to justify the current levels of expenditure, or whether some reallocation of resources within the education sector would not increase the return. A single figure—the rate of return—can be used to show the relationship between costs and benefits which occur at different points of time, and brings home the important fact that the return on the particular investment might be high either because the benefits in terms of increased national productivity are great, or because the costs in terms of resources withdrawn from alternative uses are small.

1.16 This kind of analysis is only likely to be useful in decisions where there is a choice of whether or not to provide *more* or *less* education—in other words to marginal decisions. Consequently most of the work on social rates of return from the UK has concentrated on the allocation of resources within the post-compulsory sector. Summarizing the reasons for our interest in the application of cost–benefit analysis to education:

(i) Resources are scarce and demand arises from other social-welfare areas—the health service, housing provision and nationalized industries—so cost–benefit analysis is seen as a way that could help to determine the necessary total level of resources needed by education.

(ii) Resources within the education sector are scarce and need to be allocated efficiently between, for example, universities and polytechnics. Cost–benefit analysis is seen as a way of indicating optimum distributions for spending allocations between various branches of the education system.

(iii) Cost-benefit analysis offers a method of evaluating policy options within the public sector, where the absence of pricing systems (in the non-market sector of the economy) makes the consequences of resource choices more difficult to calculate.

Self-assessment Question 1

(i) Suggest three reasons why a 'decision-maker' in central government might ask for a cost-benefit analysis to be undertaken in education.

(ii) Give examples of three current issues in education where you think cost-benefit analysis might be useful.

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2 Identifying costs and benefits

2.1 Now, under the two separate headings of *benefits* and *costs* let us review:

(i) the main components included as the costs and the benefits;

(ii) the way in which these components differ from those included under private costs and benefits;

(iii) the main sources of data and empirical evidence;

(iv) the main assumptions that are made in using these data for cost-benefit analysis.

2.2 We are concerned with identifying and measuring those benefits of educational provision that are broadly economic. It could be argued that the main objectives of education are not economic; that it is concerned with provision of equal opportunities, or with developing social and cultural values; but these benefits are not easily quantified. This is not a problem peculiar to the calculation of social rates of return to education: it exists in evaluating all public investment, and is similar to those environmental factors that we noticed earlier, such as the construction of a beautiful building or the existence of excessive noise (which is a negative benefit).

The benefits

2.3 The benefits to society from educational investment are assumed to consist of the direct monetary benefits, or the increase in national output measured by extra earnings; the externalities, 'spillovers', or 'neighbourhood' effects, which are benefits accruing to agencies other than the one that makes the investment; the non-pecuniary and fringe benefits; and the consumption benefits such as job satisfaction. We shall now examine each of these in turn.

The direct monetary benefits

2.4 At the community level, direct economic benefits are the increases in output that accrue to society as a whole from the increased productivity of educated people. (We shall discuss the concept of productivity shortly.) This increase in productivity is measured by the extra earnings associated with additional education. So it is the difference between what a person with a degree earns and what he might have earned with GCE A levels that measures increases in productivity resulting from undergraduate education; similarly it is the difference between the earnings of graduates and postgraduates which measures the increased productivity associated with either a master's or a doctorate degree.

2.5 The direct economic benefits are measured by the *gross* earnings differentials, as these reflect the value of additional output produced; no reduction is made for direct taxation. This contrasts with the direct economic benefits used to measure the return on individual investment in education, where an allowance is made for the payment of direct taxes, since these reduce benefits enjoyed by the individual. In measuring the benefits to society it is the total output measured by gross differential earnings which is relevant. This represents the total benefit to the community from investment in education.

2.6 You may well ask: what is the evidence for this? Most of the published evidence in the UK in fact derives from census data, collected in a follow-up survey to the 1966 Sample Census of Population.

2.7 A summary of some relevant results are shown in Table 1 and Figure 1. Here the earnings of educated people at various ages have been grouped together in quinquennial age-groups for a number of different educational qualifications—first degrees, master's and doctor's degrees, part-time technical qualifications for men and women, and 'all employees' (which of course includes those with qualifications). You will already be familiar with some of these data from your study of private rates of return (the same source of census data has been used to calculate both social and private rates of return).

TABLE 1 Mean annual earnings by age-group and educational qualification (men and women) 1966–7 (£s)

	Men						Women	
Age	All employees	HNC	HNC–PQ*	First degree	Master's degree	Doctorate	All employees	First degree
20–24	890	1,110	1,340	1,130	1,210	1,330	560	1,020
25–29	1,100	1,390	1,510	1,560	1,570	1,650	600	1,100
30–34	1,190	1,560	1,720	2,100	2,870	2,180	520	1,360
35–39	1,230	1,760	2,030	2,560	2,850	2,640		1,380
40–44	1,240	1,860	2,340	3,150	3,060	3,890	530	1,220
45–49	1,250	1,790	2,520	3,520	3,000	3,590		1,770
50–54	1,200	2,020	2,320	3,060	4,200	3,900	530	1,480
55–59	1,130	1,860	2,470	3,720	3,670	3,500		1,750
60–64	1,030	2,060	1,520	4,130	3,650	5,340	450	1,870
65 and over	1,050	2,880	1,520	2,360	4,460	3,670	370	560
Overall average	1,120	1,590	2,020	2,550	2,820	3,000	510	1,320

*HNC–PQ is an abbreviation for HNC with professional qualifications.

SOURCE: Morris, V. and Ziderman, A. (May 1971) 'The economic return on investment in higher education in England and Wales', *Economic Trends*, London, HMSO.

2.8 We will briefly review some of the characteristics of these age–earnings profiles that are most relevant for social cost–benefit analysis. These include:

(i) the consistent rise in earnings with age;

(ii) the close association of mean earnings with each level of additional education or qualification;

(iii) the increasing differential with age at each additional qualification level; people with degrees earn more than those with professional qualifications or part-time technical qualifications;

(iv) similarly the earnings differential between higher-degree graduates and 'all employees' is greater and increases more than the differential between first-degree graduates and 'all employees';

(v) not only do women earn less, age for age, than men, but the differential between qualified and unqualified is also smaller (see Figure 8 on p. 36);

(vi) earnings decline after the age of 60.

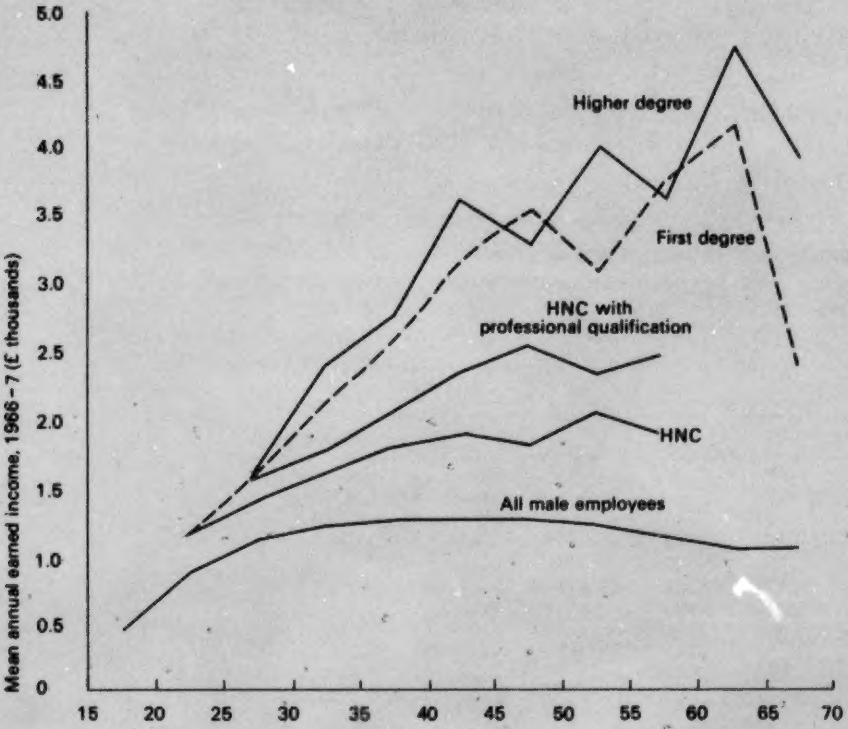

Figure 1 Age–earnings profiles for educational levels

SOURCE: Morris, V. and Ziderman, A., op. cit. (Table 1).

2.9 Remember that it is the differential earnings between two educational qualifications that are being used to measure the increase in productivity associated with additional education.

2.10 These differentials exist not only between different levels of qualification but also between *different subjects.* Some such subject differentials are shown in Table 2 for arts, social science, science and technology graduates. You should note:

(i) the higher overall average earnings of graduates in the arts and social sciences than those in science and technology;

(ii) the very close similarity between all subjects in starting and general salary levels up to the age of about thirty.

2.11 We shall return to further consideration of these data and their use in estimating social rates of return in sections 3 and 4.

TABLE 2 Mean annual earnings by age, qualification and subject for men, 1966–7 (£s)

	Men			
Age	Arts	Social science	Science	Technology
20–24	1,160	1,040	1,120	1,200
25–29	1,500	1,540	1,510	1,680
30–34	2,030	2,430	1,960	2,080
35–39	2,730	2,440	2,290	2,830
40–44	2,730	3,510	2,980	3,190
45–49	3,160	3,490	4,130	3,350
50–54	2,490	2,280	3,430	2,930
55–59	4,510	2,950	3,490	3,810
60–64	5,260	4,830	2,180	3,260
66 and over	3,940	2,200	1,420	2,020
Overall average	2,650	2,680	2,370	2,560

SOURCE: Morris, V. (1973) 'Investment in higher education in England and Wales' in Fowler, G. *et al.* (1973) *Decision-making in British education*, London, Heinemann Educational Books Ltd.

Self-assessment Question 2

In which ways are the average earning profiles by subject:

(i) similar;

(ii) dissimilar to those of qualification levels?

2.12 A number of *assumptions* are made in measuring the direct benefits of educational investment. But there is one particularly important assumption underlying the theoretical framework for measuring social rates of return, that is the concept of *marginal productivity*. There is also an important aspect of the data information which has to be used in the absence of regular income surveys in the UK—that is *cross-section* information. We shall now consider each of these in turn.

Marginal productivity

2.13 In using gross earnings as a measure of social benefits the assumption is made that these earnings correspond in value to the increase in total production brought about by employing one more man in an enterprise. In turn, assuming that the business objectives of private industry are to maximize profits, the working assumption is made that earnings reflect the value of a person's marginal productivity. In other words, if we had one man fewer with A levels we should lose the production indicated by the A-level earnings profile; but with one more graduate we should gain the production shown by the graduate profile. The social gain from turning one man into a graduate is thus the difference between the two profiles.

2.14 What does the marginal productivity of labour mean? Put rather simply, it is a method of measuring the increase in output due to a small increase in labour inputs. This can be measured most easily when the quantity of the other inputs, such as capital, which contribute to production are held constant.

2.15 Depending on the prevailing conditions of production, increasing the input of labour may first give rise to increasing output, but eventually as more and more labour is employed to operate the same capital, the marginal output of labour will begin to decrease. What is happening is that while total output goes on increasing it does so only at a diminishing rate. The employment of each additional man or woman is leading to

TABLE 3

Quantity of labour (men)	Total product	Average productivity	Marginal productivity
1	8	8.0	8
2	24	12.0	16
3	34	11.3	10
4	40	10.0	6
5	42	8.4	2

diminishing returns. The marginal product of labour is measured by the increase in total product due to the employment of one more person. This is illustrated in Table 3.

2.16 Why is this concept of marginal productivity relevant to measuring social benefit? You will recall that we are interested in measuring the economic benefits to society from education, and that one of the suggested benefits is the increase in output or production associated with additional education, measured by increased earnings. Consequently we need to know whether the observed increase in earnings can be taken as a measure of increased productivity and output.

2.17 Labour, both qualified and unqualified, is employed for its contribution to the production of goods, leading to increased revenue or receipts of a firm or industry. So the demand for labour is *derived* from the demand for the products of a firm or industry. For example, it pays a firm to employ more labour if the value of the extra output produced by that labour exceeds its cost (measured by wage or salary paid). But if a person does not add as much to the value of output as he is paid in salary or wages then he is unlikely to be employed by a profit-maximizing firm. A firm's demand for labour can be illustrated by Figure 2.

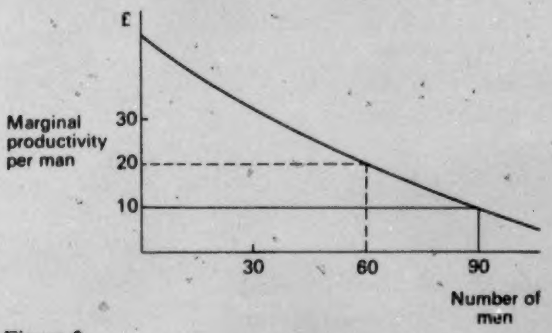

Figure 2

In this diagram the vertical axis measures the value of the marginal product of labour, i.e. the net revenue a firm or industry derives from the sale of goods or services (output) resulting from the employment of each additional man (unit of labour). The horizontal axis measures the number of men employed. An industry's *demand curve* for labour shows the number of additional men that will be taken on at each level of productivity. The curve slopes downwards from left to right because all other inputs for the purposes of the illustrative example are—you will recall—being held constant. And although (as we saw in paragraph 2.15) marginal productivity may first increase, when the capital employed is held constant, the productivity of labour will ultimately fall. So the demand curve shows that the value of the marginal output of 60 men is £20, but that of 90 men is only £10.

2.18 Assuming, however, men wish to optimize their earnings then the higher the wage the more people will seek employment, and the lower the wage or salary the fewer will seek employment. Consequently the *supply curve* of labour will show the relationship shown in Figure 3.

In Figure 3, as the wage offered increases so, too, does the number of men wishing to be employed. For example at £20 only 60 men seek employment, but at £30 90 men offer themselves for employment.

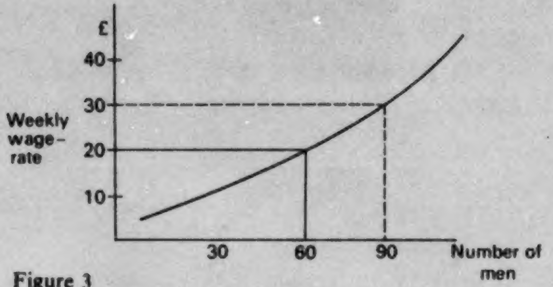

Figure 3

2.19 Bringing the supply of manpower and the demand by industry together, we find that wages will settle at £20 a week, with 60 men being employed (see Figure 4).

What has happened? Both industry and manpower have gone on bargaining until a satisfactory, competitive, *equilibrium rate* has been reached, where 60 men are now prepared to work for £20. Whereas at £30, 90 men sought employment but industry was only prepared to take on 30.

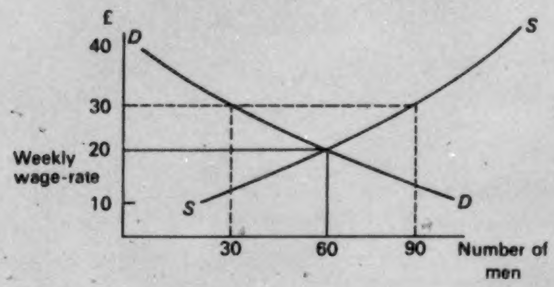

Figure 4

Self-assessment Question 3

What happened to demand and supply when the weekly wage offered was £10?

2.20 So industry employs men up to the point where the value of their marginal output measured by marginal revenue product from sale of goods is equal to the wage-rate, i.e. in this example where the marginal productivity of the last men employed is £20.

2.21 So in this example, earnings do measure marginal productivity, and the contributions to output. This is because the market is fully competitive in the private sector where employers are trying to maximize profits, and employees are trying to maximize wages; moreover, both have full knowledge of opportunities in the competitive market, and labour is fully mobile.

2.22 We can conclude that if the labour market is competitive and employers act rationally, knowing the value of employing certain types of qualified manpower, and employees are fully aware of alternative wage-rates, then wages will indeed correspond to marginal productivity.

2.23 However, is there always full competition in the labour market? Certain types of labour can influence their earnings, by controlling entry into the occupation (as with monopoly power, for example entry into the medical profession), while some employers have considerable control over buying labour (as with monopsony power, for example entry into the Civil Service). Also, knowledge is not always perfect, many employers do not know how their profits will be affected by employing more qualified labour, and employees are often not well informed about job opportunities. For these reasons it has sometimes been objected that the imperfections of the labour market make extra earnings a poor measure of extra production. It could equally well be argued that the labour market will nevertheless be tending towards an equilibrium; moreover, monopoly and monopsony power are sometimes, although not always, temporary, and it could be said that only marginal adjustments are necessary.

2.24 A further objection arises from the conceptual difficulty associated with summing separate industry or company responses into an aggregate social product function. This is a general problem which economists face in moving from micro-analysis (at the firm level) to macro-analysis (for the economy as a whole). It is only necessary that you should be aware of the problem and that no satisfactory solution has been found for it.

2.25 However, we return to the issue of the imperfections in the labour market. This has been widely discussed by those who believe that the imperfections in the labour market which do exist are not sufficiently significant to invalidate the results of a rate-of-return analysis to education: and on the other hand by those who believe the imperfections are so great that earnings have nothing or at least very little to do with marginal productivity.

Reading 1 Blaug discusses this at length, and you should now read pages 205–9 in the set book very carefully, and also read other pages in the set book which are referred to in that section.

2.26 Clearly there is disagreement between economists about whether the higher earnings of educated people really can be taken as a measure of the direct economic benefits of education, or whether these in fact only reflect imperfections in the labour market. However, as a first approximation and in the absence of any other general theory of distribution there may be no reason to suppose that, in the long run, *educated* workers will be paid consistently more or less than their marginal product—at least in the *private sector*. This is not to deny that there are market imperfections, nor that marginal product can be accurately measured in all occupations, especially those in the *public sector*, where there is government control or intervention on behalf of, for example, members of parliament, doctors, teachers, or civil servants. Moreover, in periods of wage restraint or incomes policy there may be good reason to suppose that wages are a poor measure of marginal productivity. The argument turns partly on whether it is the public sector that sets the level of wages in the private sector or the private sector that sets it for the public. There used to be rule of thumb used in the public sector called 'fair comparisons', which meant that civil service salaries should not fall below those that public servants might expect to earn in the private sector, so that they would in fact be paid the marginal productivity rate.

Self-assessment Question 4

Would you expect the following situations to result in earnings being greater or less than the marginal productivity of labour?

(i) Trade-union action resulting in withdrawal of labour from the market;

(ii) Quota restrictions on entry of women into medical schools;

(iii) Long summer holidays of university teachers.

2.27 We have so far been talking about the *economic explanation* for the association of higher earnings with more education. And this explanation, as we have seen, is based (from the point of view of society) on the idea that both industry and individuals seek to maximize their profits in relatively competitive markets: industry taking on additional labour up to the point where the extra productivity, or marginal product, of an additional man or woman is equal to the wage-rate (price) at which that man or woman is prepared to accept employment. However, it can be argued that labour markets are not competitive, and that even if they were there are other more important explanations for the correlation of education and earnings.

2.28 You will have already come across the idea that earnings reflect the effects of influences other than educational ones. Sometimes these have been grouped together as the *sociological explanation* of the correlation between education and earnings on the grounds that it is socio-economic influences, along with natural ability, which explain the higher earnings of the more educated. In other words education only serves to reinforce those personal characteristics which would in any case have led to the higher earnings. It is those gifted individuals born with the advantage of a naturally high intellect, along with good social-class backgrounds, environmental encouragement, and so on, who benefit most from extra education, and furthermore who would earn more than the less fortunately endowed whether or not they took advantage of extra educational provision.

2.29 Another proposal advanced to explain the correlation between earnings and additional education has been called the *psychological explanation* or *screening hypothesis*, suggesting that employers use educational qualifications as proxy measures of ability, to predict future levels of performance.

2.30 Employers operate recruitment policies not on the basis of expected productivity but rather on the basis of past experience, which suggests a high correlation between educational qualification and the kind of attributes needed by the enterprise. In other words, education is a convenient method of certification used by employers who bear none of the costs, and eliminates the need to use other selection procedures. In fact this is contrary to the evidence—because many employers already prefer to use their own well-developed aptitude tests instead of accepting only educational qualifications, which at the moment they find poor measures of future performance.

2.31 If the screening hypothesis is the correct explanation of the association between earnings and education, then the implication must be that the only economic benefits of education to society are those of providing employers with useful recruitment devices. This is a service which could, after all, be provided more cheaply, and the question arises of who should pay for this service—society, through subsidies, as it now does, or industry. But then industry already does bear the cost of using its own aptitude testing as a substitute for the poor utility of the indicators of the educational system: it sometimes prefers to recruit people with two or three 'good' A levels, and then train them, rather than recruit over-specialized graduates.

2.32 So the screening hypothesis is relevant only if education is seen as a kind of general training, which does little more than rubber-stamp innate capacities of ability and drive. It is not a sufficient explanation for the higher earnings of large groups of qualified manpower such as doctors, accountants, teachers, and scientists; even economists need very specific professional training.

2.33 In other words, there are still strong grounds for supposing that education (and training) contribute to the observed fact that qualified manpower earns more than unqualified (though social-economic background and natural ability do also affect the outcome). Blaug summarizes:-

> As we suspected all along, there is a sense in which all three explanations hold simultaneously. Employers pay educated people more, even when their education has taught them no specific skill, because they are more achievement-motivated, more self-reliant, act with greater initiative in problem-solving situations, adapt themselves more easily to changing circumstances, assume supervisory responsibilities more quickly, and benefit more from work experience and on-the-job training. They pay them more not only when they hire them but they go on paying them more throughout their working life. In short, they expect them to be more productive than less-educated people and the expectation is borne out. The weakness of the 'sociological' and 'psychological explanation' is precisely that the advantages of more-educated people show up at every age throughout working life.[2]

Cross-section data

2.34 We now turn to a second assumption associated with estimating social rates of return—namely the use of *cross-section data.* Most of these data are collected by questionnaires, so the age–earnings profiles are for a cross-section of the community at one point in time (Tables 1 and 2 are for example based on census information collected in April 1968). These cross-section data are assumed to reflect the direct economic monetary benefits to society from investment in additional education, the inference being that future earnings of a 1968 conventional university graduate at age 50 are indicated by the observed earnings of a 50-year-old graduate in 1968.

2.35 Inevitably there are problems in using cross-section data as a proxy for lifetime income. On the other hand there would also be problems in using longitudinal data, where the effects of different variables change over time. Ideally the most useful information would be based on regular collection of cross-section data, but this is not yet available for the UK, although it does exist in the USA. So we have to make the best of what we have.

2.36 But let us now briefly revise the justification for using the cross-section data with which you are already familiar from the study of private rates of return: namely, that it is only the first ten or perhaps fifteen years of lifetime earnings which are sensitive to the discount rate; that there are not significant shifts in the earning differentials; and that the quality of education does not change so significantly as to invalidate the results based on current earnings. There is no reason to suppose that time-series or longitudinal data would be any more satisfactory than cross-section data. Moreover, policy decisions are usually made by governments on the basis of current information, or at least that which can be used in the foreseeable future—say over a five- or ten-year period. Data relating to twenty–thirty years hence are unlikely to be much use in a policy context.

Indirect monetary benefits

2.37 These are increased earnings benefits which accrue to others than those receiving extra education. These indirect monetary benefits accrue mainly in two ways: through increments in the *current earnings* of workers other than the educated—educating some workers raises the productivity of others; and through increments in the *future earnings* of subsequent generations resulting from a better-educated present generation—benefits which accrue to the future family of the educated. We examine each of these in turn.

2.38 Weisbrod has called these indirect social benefits 'employment-related external benefits' in referring to increases in the productivity of unqualified workers resulting from the employment of qualified manpower.[3] He argues that education develops management abilities and leads to the diffusion of skills through the labour force, raising the productivity and earnings of workers other than those who received the additional education and thereby increasing the return to society of its investment in education.

2.39 There are of course difficulties in distinguishing changes in the productivity of unqualified workers from shifts in the demand for the qualified and unqualified which may be caused by changes in their relative supply. For example, the advantage of some full-time training may be perceived by an increasing number of early school-leavers, thereby reducing the supply of the early school-leavers to the labour force; this may lead to an increase in the earnings of those who remain. Is this a productivity or a supply-and-demand effect?

Reading 2 **Blaug discusses the problem: and you should now read pp. 110–13 in the set book.**

2.40 We come now to the indirect monetary benefits of future generations. These are largely the benefits which accrue to society via the family of the person being educated. There are a number of ways in which this effect could be identified and measured. The extra earnings of the educated in one generation may be partly attributed, as an external benefit, to the preceding generation. The effect of such a calculation would be to increase the total social benefits occurring in the first generation. Using the earnings data associated with the additional education received by children of educated parents, Swift and Weisbrod estimate the value of this extra education and express this as part of the rate of return on the parents' education.[4] The results suggest a return more than sufficient to cover the costs of the parents' education.

Externalities

2.41 External benefits are those which accrue to people or organizations other than the individual investor. In other words they consist of benefits other than monetary ones measured by the extra earnings of educated manpower. These benefits are not transmitted through the pricing system, so proxy monetary valuations have to be found; they may affect either production or consumption, and be positive or negative (costs). Externalities have often been referred to in the economics of education as the 'neighbourhood' or 'spillover' effects of education. As the concept of externalities is very far-reaching it is necessary to define the extent to which they should enter into calculations of social returns to investment. So we now look at some examples of these externalities; the problem of identifying and measuring them; and the results of some attempts at qualification.

2.42 Schooling is said to provide an opportunity for mothers to work, and the benefits measured by the earnings of working mothers of children aged 6 to 11 were estimated for the USA in 1956 to have been about $2,000 million.

2.43 Increases in knowledge and research are likely to affect the level of output which may come about through the introduction of new products or new production methods or improved working conditions. Very little work has been done on measuring and identifying the effect which education has on promoting technical change, but Byatt and Cohen have suggested a framework for doing so.[5]

2.44 Benefits accruing to society in general have been said to include the value of literacy, the development of cultural values, reduction in crime and other nuisance activities, increased social cohesion and political stability. Many of the external benefits in this category cannot be easily quantified and consequently have to be excluded from cost–benefit calculations.

Reading 3 You should now read O'Donoghue (set book), chapter 4, sections III, IV and V.

2.45 The fact that it is not possible to value all the external benefits is not, as we have already seen, peculiar to the calculation of social returns in education; it is a major problem in evaluating all public investment. The benefits of education are, however, very widely diffused, which makes the problem more acute. But it has been suggested that although the indirect returns to education cannot be completely or separately measured at least an upper limit can be put to the social rate of return, a lower limit being provided by the return in terms of the direct benefits. An upper limit is derived from the estimated contribution of education to economic growth by Denison of about 25 per cent in the USA; and a lower limit is derived from the direct economic returns of about 12 per cent. It is not easy to tell whether or not this is a realistic estimate, but the main point is that the valuation of external benefits (which have to be offset by the external costs) would almost certainly be shown to increase the net social benefits of investment in education.

Direct non-monetary benefits

2.46 Fringe benefits include free housing accommodation, preferential mortgage arrangements, or use of a car, for which a monetary value can be imputed. The important point here is that in so far as they are available and enable the employer to pay less than he would otherwise have to, the social economic benefit is greater than is measured by money earnings.

Consumption benefits

2.47 These are often referred to in the literature as the 'psychic' effects. They include the non-pecuniary benefits of long holidays associated with certain occupations, like the attractions certain jobs might have for the qualified, such as university- or school-teaching.

2.48 Other examples include the satisfaction derived from the kind of employment open to educated personnel; the job satisfaction or access to more interesting jobs. These consumption benefits may of course be recognized by employers, leading certain groups to receive lower earnings than they could from alternative employment, which might mean that earnings and marginal productivity diverge, but so long as the relative earnings between two jobs accurately reflect the differing non-pecuniary attractions then these earnings will accurately reflect the relative scarcities of labour available for the two jobs, and their marginal productivities.

2.49 The difficulty in measuring the direct consumption benefits is that their value to society may be viewed differently by different groups at different points in time. O'Donoghue suggests that some useful economic data (or at least quantifiable data) might be obtained by asking different groups to place a value on consumption benefits from education.

2.50 The difficulties associated with finding some monetary value for benefits are well exemplified by various attempts to estimate the non-market work of women, where, for example, an imputed value for housework by pricing items such as cooking and cleaning, has been estimated by the market price of buying labour to do these chores. The relevant measure for social rates of return would be, of course, the value of the *differential* between qualified and unqualified women. An alternative method might be to use the differential earnings forgone as a measure of the value to society of women's time in non-market work. Attempts at these measurement problems have yielded large figures, for example one-sixth of GNP in the USA. The inclusion of a value for non-monetary work might be expected to increase the social rate of return.

2.51 We have now covered the main components of the benefit side for calculating the social returns of investment. These include the direct economic benefits and externalities; the fringe and non-pecuniary benefits; and the consumption benefits. We have seen that the direct economic benefits can be fairly readily identified and measured after making certain assumptions on marginal productivity and the validity of cross-section data. There are, however, considerable difficulties in both identifying and measuring the externalities and intangible, non-pecuniary, consumption and non-marketed benefits.

2.52 The measures relevant to public investment decisions are those which include both the direct and external benefits, using proxy monetary values for the non-marketed benefits. The difficulty of deriving imputed values has meant that most cost–benefit analysis in education has included only the direct benefits, thereby making the analysis more closely akin to an investment appraisal. For the same reason there is less difference between the social and private benefits than would be the case were externalities included.

Self-assessment Question 5

Say whether the following items are externalities, direct benefits, fringe benefits, non-pecuniary benefits or consumption benefits:

(i) Increased leisure-time for mothers.
(ii) Students' enjoyment of a course of study.
(iii) Reduced rates of crime resulting from raising the school-leaving age.
(iv) Luncheon vouchers.
(v) An increase in the earnings of computer operators following some radical technical advance in the computer industry.
(vi) A better-informed electorate.
(vii) A free car.
(viii) Activities by the highly educated in creating voluntary community centres, or child-care centres.
(ix) Increased use of public libraries.
(x) The earnings of working mothers.

The costs

2.53 Just as the earnings of qualified manpower are taken as measures of the *future benefits* from education, so too are the costs taken as a measure of *investment* in education. For this reason the cost estimates measure the current investment necessary for the creation of a *new student place* rather than the historic costs incurred in provision of educational facilities for those who are now qualified.

2.54 The costs incurred by society in educational provision beyond the minimum school-leaving age are estimated by the total monetary value of goods and services withdrawn from alternative uses or investments. They include:

(i) *direct* expenditure on education consisting of recurrent and capital costs;

(ii) *indirect* costs consisting of imputed value for output lost to society through the non-participation of students in the labour force;

(iv) a notional cost for leisure-time lost.

These are the *social costs* sometimes referred to as the *total resource costs to society* of educational provision.

2.55 Excluded from these social costs are transfer expenditures such as students' grants, which represent transfers of income from one section of society to another rather than a resource cost to society. This is discussed again in Paper 3 of Block III.

Self-assessment Question 6

Make a list of the differences which you have encountered so far between the items included as costs and benefits in social and private rate-of-return calculations.

Direct costs

The recurrent costs

2.56 These include the institutional costs of teachers' salaries; administration; the value of equipment and materials; and the costs of research. These data are usually first collected on the basis of an average annual cost per student (unit cost), and are shown in Table 4, for different qualifications and subjects. The table shows:

(i) the costs of full-time higher education are significantly higher than part-time technical education;

(ii) the average costs increase with each additional qualification—so the cheapest qualifications are ONC and A level, while the most expensive investments are in postgraduate education;

(iii) there are noticeable differences between subjects—provision of science or technology places involves greater expenditure by society than provision of undergraduate or postgraduate places in arts or social science;

(iv) the inclusion of research costs has the effect of substantially increasing the overall cost of provision. Costs including and excluding research are included because of the effect on social rates of return of, on the one hand including the costs of lecturers' private research, and on the other of excluding it. (The problem lies in deciding whether or not teaching and research are joint products, making it impossible to conceive of an increase in the scale of teaching without additional research. This is taken up again more fully in Paper 3 of Block III.)

Capital costs

2.57 These costs, which are also illustrated in Table 4, are based on the capital investment needed to create facilities and buildings for a new student place. The life of such buildings, once created, might well be sixty years or more. The method which is used to convert this capital asset, i.e. the capital cost of the new student place, to an annual capital charge, is to estimate the annual payment needed to repay the principal

TABLE 4 Average annual recurrent and capital costs (£) of each qualification 1967–8

Educational qualification	Average recurrent costs		Capital cost per new student place*
	Excluding research	Including research	
O level – 4 passes	155	155	571
A level – 3 passes	239	239	771
First degree:	459	694	2,408
Arts	413	597	1,702
Social science	334	487	1,702
Science	492	790	3,136
Technology	662	977	3,757
Master's degree:	905	1,385	3,538
Arts and social science	630	903	2,034
Science and technology	1,104	1,723	5,516
Doctorate degree:	905	1,385	3,538
Arts and social science	630	903	2,034
Science and technology	1,104	1,723	5,516
ONC	90	90	528
HNC	118	123	727
HNC with professional qualifications	139	145	727

*These capital costs have to be annuitized to give an annual rental figure over the assumed life of the capital – see paragraph 2.57.

SOURCE: Morris, V., op. cit. (see Table 2).

over the life of the asset. This is done by amortizing the asset at some assumed long-term rate of capital repayment. The capital cost figures in Table 4 illustrate very considerable differences between subjects; the capital costs in science and engineering subjects being greater than in arts and social science. The table also illustrates the increasing capital costs of each additional education level (just as recurrent costs increased).

Total direct costs

2.58 These are the combined recurrent and capital costs, which are illustrated in Table 4, i.e. *direct unit costs.* Most of these direct costs are met from public expenditure, which is why they are included in calculating social rates of return, but excluded in calculating private rates of return (where the costs consist mainly of students' forgone earnings).

The indirect costs

2.59 These consist of the imputed value of the output or production forgone by society while students are in higher education rather than at work. The imputed value is usually derived by taking the earnings which students might have been paid had they entered the labour force with the preceding qualifications; for example the indirect costs of a first degree consist of three years' A-level earnings. (Vacation earnings are usually added to the benefit streams.)

2.60 The imputed value of output lost for part-time qualification raises a number of problems which do not need to worry us here. But in practice it is often assumed that some output is lost to society while workers are not in the labour force—the amount depending on the length of their absence from work.

External costs

2.61 These are the costs (as with the benefits) that fall on persons other than those being educated. For example, there is some evidence that the last year of compulsory education is the heaviest one for juvenile delinquency and that the tendency towards crime during school years is reversed when pupils leave school and go to work. Or to take another example, there may be external costs involved for society where extra police are needed to control student demonstrations, or the disgruntled elite. Estimates of these external costs, as with the external benefits, are rarely included in the calculations, owing to difficulties of quantification.

Total resource costs per annum

2.62 These consist of: the annual average direct costs (recurrent and capital); and the average annual indirect costs (forgone earnings); as well as external costs (if these could be estimated).

The qualification or course costs

2.63 So far we have only been looking at the 'unit' costs or *average annual* costs of educational provision. But in order to estimate the *social* costs we need to look at those costs associated with the whole course leading to a particular qualification. These can be derived by multiplying annual costs by the length of the course, for example in the case of first-degree qualifications, three years' undergraduate costs could be taken. But ought we not to be calculating the costs of educating the person who succeeds? For example, let us say, for every hundred graduates there are 120 who start the course. In other words, the cost of producing the hundred graduates is that of educating 120. The difficulty arises in deciding whether or not there is any corresponding benefit obtained from the education of the twenty. Where the benefits relate to the earnings differentials associated with qualifications it is, however, clearly the cost of obtaining a qualification which measures the size of the investment by society.

TABLE 5 Total resource course costs (£) for each qualification per successful student* 1967–8

Educational qualification	Recurrent costs	Capital costs	Forgone earnings	Total resources
O level (4 passes)	196	58	366	620
A level (3 passes)	744	195	1,050	1,989
First degree:	2,234	626	1,805	4,665
Arts	1,900	439	1,784	4,123
Social science	1,541	435	1,778	3,754
Science	2,536	814	1,800	5,150
Technology	3,235	1,005	1,853	6,093
Master's degree:	3,691	761	2,400	6,852
Arts and social science	2,472	451	2,607	5,530
Science and technology	4,433	1,147	2,234	7,814
Doctorate degree: †	5,363	1,107	3,992	10,464
Arts and social science	3,685	670	4,320	8,675
Science and technology	6,593	1,706	3,875	12,174
ONC	283	133	186	602
HNC	371	177	258	806
HNC with professional qualifications	513	208	—	721

* The figures include research costs.
† Doctorate compared with first degree.

SOURCE: Morris, V., op. cit. (Table 2).

2.64 How are these qualification costs measured? They need to include adjustments for examination failure, for wastage or drop-out, for repetition of various parts of the course as well as for length of the total course. The effect of such adjustments to the 'unit' costs are shown in Table 5, where they are shown as recurrent and capital costs per successful student. As you would expect, these direct course costs are greater than the average annual direct costs of Table 4. The indirect costs per successful student are also shown in Table 5, and they account for a substantial proportion of the total resource costs. *The total resource costs are the sum of the direct and indirect course costs.*

2.65 You may, however, object that it is not just the cost of obtaining a qualification that is relevant but also the costs of obtaining the necessary entry qualifications. For example, to get a first degree, the student must usually have the relevant *entry* qualifications (unless they are mature students), which include appropriate O- and A-level passes. So it is the *cumulative* cost of obtaining qualifications at each step in the educational ladder that measures the whole of society's investment. These cumulative costs are derived by summing each of the total resource costs for the course, or qualification which it is thought necessary to complete in order to proceed to the next stage, and some are shown in Table 6. For example, if we assumed that to start a first-degree course it is generally necessary to have O and A levels then these two costs are summed along with the first-degree costs to give the cumulative social costs of obtaining a first degree, i.e. £4,053.

TABLE 6 Total cumulative costs (£) for each qualification (from age 15)* 1967–8

Educational qualification	Direct costs	Total resource costs
O levels (4 passes)	254	620
A levels (3 passes)	1,193	2,609
First degree	4,053	7,274
Master's degree	8,505	14,126
Doctorate	10,525	17,738
ONC	650	602
HNC	1,198	1,408
HNC with professional qualifications	1,919	2,129

*Cost includes research.
SOURCE: Morris, V. and Ziderman, A., op. cit. (Table 1).

Self-assessment Question 7

(i) From Table 5 can you estimate the cumulative total resource costs to society of: a degree in arts; a degree in science; a master's degree in 'arts and social science'?

(ii) The costs in Table 6 are based on a minimum school-leaving age of 15—this has now been raised to 16. What effect would you expect this to have on direct costs and total resource costs?

3 Measuring social investment

Relating the costs and benefits

3.1 We are now in a position to bring the benefits and costs together to see how social rates of return are estimated. These returns measure the economic benefits to society of additional education. The analysis involves a comparison of the costs and benefits; the social benefits being measured by cross-section age–earnings profiles (pre-tax), of the kind illustrated in Figure 1, of those persons with higher education, taken as proxy for future lifetime earnings; the social costs or total resources are measured by the direct and indirect costs, or put another way the total monetary value of goods and services withdrawn from alternative uses, in order to provide the necessary educational investment.

Adjustments to the benefits

3.2 Frequently certain adjustments are made to the benefit streams before calculating the rates of return. The recorded annual earnings of the kind shown in Figure 1 and Table 1 are corrected for the probability of inactivity, unemployment and mortality (you will recall similar corrections being made in the calculation of private rates of return), since society will not derive the economic benefit of these earnings in full.

3.3 First there is the probability that the rate of *unemployment* reflected in the cross-section data for a particular point in time may be different from that which prevails over a period of forty to forty-five working years. There is some evidence to suggest that rates of unemployment are lower for the more highly qualified. Rates may also vary at different ages as well as between different qualification levels and subjects. One method of making this correction is to record people's employment status at the time the data were collected—thereby making an automatic correction for unemployment levels (assuming a fairly typical situation without particularly high levels of unemployment).

3.4 Next, *participation* in the labour force may vary, for example between men and women. Age–earnings profiles are therefore corrected for the probability of non-participation in the labour force—differential activity rates are found for people with different educational qualifications. The overall effect of these activity-rate corrections, like that for unemployment, is to reduce the expected benefits from higher education, particularly for women.

3.5 Finally, it is unlikely that the full benefits of all those receiving additional education will accrue to society since some will not *survive* to retirement. Further, there are differential survival rates for men and women—they are higher for women, and higher for the qualified than the unqualified. So the effect of this correction is also to reduce the expected benefits to society from investment in education.

Adjustments to differential earnings

3.6 As we saw earlier, there is evidence to suggest that higher earnings are associated with such factors as natural ability, talent and family background as well as educational training. But while there is considerable evidence to suggest that environmental factors and natural intelligence do have significant effects on educational performance and achievement levels, it is more difficult to establish that these factors rather than educational qualifications actually determine the earnings obtained by highly qualified manpower.

3.7 There is no evidence for the UK on what proportion of differential earnings may be attributed solely to additional education expenditure; indeed different proportions may be appropriate for different qualifications levels. Moreover, the nature of British education, with its high standards of entry for progression from one level to the next, means that the differential effects of home background on performance may have largely ceased to operate by the time students enter the sixth form, and certainly by the time they enter higher education.

3.8 Multivariate analysis and cohort studies may help to elucidate some of these issues. Indeed, American evidence suggests alternative estimates of the fraction of the earnings differentials due to educational provision, which range from 0.5 to 0.75, although the fraction which has been most frequently adopted in the USA is 0.66. The *differential* streams of social benefits are therefore adjusted to allow for the effects of these environmental and genetic factors.

Reading 4 If you have not already done so you should now read Blaug, *An introduction to the economics of education* (set book) pp. 32–46.

Self-assessment Question 8

What does Blaug mean when he says 'Favourable home background determines to some extent who it is that obtains additional education: nevertheless it does not explain why the better educated receive higher lifetime incomes'? Explain this in your own words.

Calculating social rates of return

3.9 The technique used to estimate the return on social investment in education is identical to that followed in estimating private rates of return. (You should now revise the relevant sections in Paper 4 of Block I.) We shall first briefly revise this technique here, then illustrate the application of it to a particular qualification—first degrees in technology.

The technique

3.10 First, the lifetime stream of mean annual earnings associated with each qualification is discounted year by year, with a selection of interest rates, to obtain the gross present values. It is the differential between any two earnings streams which is taken to measure the economic benefits. Consequently, the gross present values are subtracted from each other to give net present value differentials. The resource costs associated with each qualification are also discounted by the same set of interest rates. The present value of costs is then subtracted from the present value of the benefits to give the net present values of investment in education. The internal rate of return on any particular educational investment is then established by that rate of discount where the present value of the benefits is no greater and no less, but is equal to the present value of the costs.

The application

3.11 In Table 7 you can see how this might work in practice for the graduate in technology. Discount rates are set out across the top, and you should note while looking at the table the effect of raising the discount rate on the present values. The first two lines across the top show the gross present values of the age–earnings profiles for A levels and BSc qualifications. These have been adjusted for unemployment, activity and survival. The next line shows the net differential benefits derived by subtraction. The fourth line shows the discounted costs of undergraduate provision. And the last line shows the net present values of the benefits—derived by subtracting the costs from benefits.

TABLE 7 Calculating the rate of return on men graduates in technology, 1966-7 (£s)

	Discount factors (%)			
	4	6	8	10
Gross benefits:				
A level	24,035	15,720	10,887	7,894
First-degree technology	37,626	23,188	15,106	10,321
Net benefits	13,591	7,468	4,219	2,427
Net costs	3,338	3,038	2,769	2,321
Net present value	10,253	4,430	1,450	106

SOURCE: Morris, V., op. cit. (Table 2).

3.12 The net present values of these benefits can be illustrated graphically to show the derivation of the rate of return, and this is done in Figure 5, which includes the net present values of the benefits for a number of other qualifications for purposes of comparison. The rate of return lies where the net present value stream cuts into the horizontal axis.

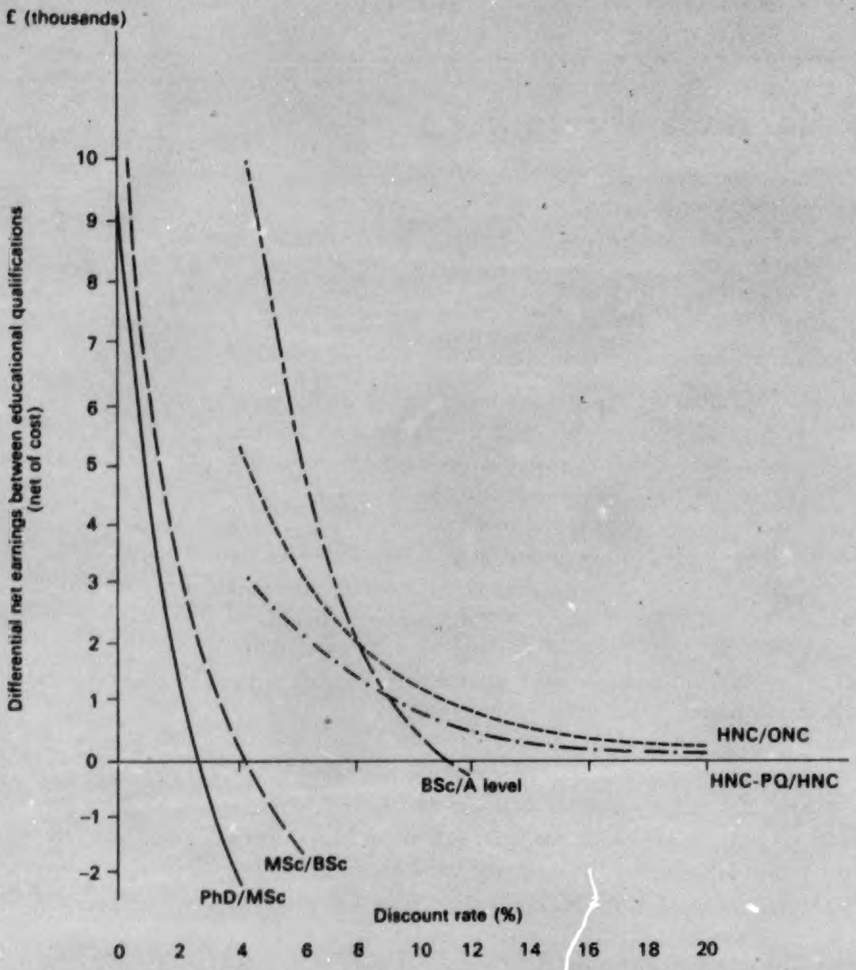

Figure 5 Present values of differential earnings (net of cost) for educational qualifications in technology

SOURCE: Morris, V., op. cit. (Table 2).

Self-assessment Question 9

From Figure 5 estimate:

(i) the rate of return on a first degree in technology;
(ii) the rate of return on a master's degree in technology;
(iii) the rate of return on a PhD.

4 Some evidence from case studies on the return on social investment

4.1 We now look at some results of cost–benefit analyses in the UK which concentrate on three main policy issues:

(i) the returns on investment to different qualifications and types of education;
(ii) the returns on investment to different subject areas;
(iii) the returns on investment to education for men and women.

4.2 We shall look at each of these problems in turn, referring to the social benefits, the social costs, and finally the social rates of return. The results often indicate clear policies, and as you read you should be thinking about how you would interpret the results, were you a policy-maker, and what action the results would indicate should be taken.

4.3 But first a few preliminary comments are needed. All the social benefit data are based on a follow-up survey to the 1966 Sample Census of Population, and most of the social cost data come from DES sources. You should now revise the discussion of social benefits in section 2, especially the distinction between direct, indirect, and external benefits—and the difficulties of trying to ascribe monetary values to the indirect and external benefits—not to mention consumption benefits. This is why all the cost–benefit analyses we discuss here are based only on direct *monetary* benefits to society. Next recall what has been said about cross-section data on earnings as a proxy for lifetime income, as well as the underlying assumption that recorded earnings do approximate to marginal productivity. This is important because these survey data are derived from a questionnaire, to 20,000 people, at one point in time. The assumption is also made in cost–benefit analysis that earnings do approximate to marginal productivity and consequently that the direct benefits to society can be measured by this cross-sectional earnings data. However, as you should note in reading, certain quite specific adjustments have been made to the data to allow for any obvious departure from the marginal productivity assumption. Moreover, adjustments have also been made to allow for the possibility that the higher earnings of the qualified reflect social or environmental effects as well as the effects of extra education. You should also be aware that adjustments were made, in the way we suggested earlier, for participation, unemployment and survival.

4.4 The cost data for most of these studies are derived from Tables 4, 5 and 6. They have been adjusted in the way suggested earlier for wastage, repetition, drop-out and length of course, and allow for including and excluding the research costs. Remember we are using the total social resource cost figures per successful student.

The rates of return

4.5 Having briefly reviewed the sources of the direct social benefits and social costs, we can now consider the social rates of return under the three policy problems outlined above, namely:

(i) returns on different educational qualifications;

(ii) returns on different subjects;

(iii) returns to men and women.

Social rates of return to educational qualifications

The direct benefits

4.6 First let us look at the direct benefits—the age-earnings profiles that you are already familiar with from Figure 1 and Table 1. These profiles are used as measures of the direct monetary benefits to society from investing in education. Briefly recapitulating, they show:

(i) the highly qualified earn more on average than the less qualified;

(ii) the differentials widen with age;

(iii) earnings tend towards a peak and then do not decrease very much thereafter;

(iv) this peak comes later the higher the level of educational qualification, for example the 'all employees' profile reaches a peak fairly early and then flattens out;

(v) the earnings of those with full-time graduate qualifications are greater than those with part-time technical qualifications;

(vi) the differential between first degree and higher degrees (master's and PhDs) is relatively narrow by comparison with that between graduates and those with part-time qualifications;

(vii) possession of a professional qualification clearly enhances the earnings of the part-timers, but these are still well below the earnings for those possessing first degrees.

The evidence is fairly conclusive that the higher the level of educational qualification the greater are the direct economic benefits to society.

The costs

4.7 However, the costs have to be set against those benefits streams; and the costs corresponding to the age-earnings profiles drawn in Figure 1 are shown in Table 5. These illustrate the much greater investment expenditure incurred by society for full-time than for part-time education—and the substantial increase in total resources, or investment expenditure by society for each extra qualification.

The rates of return

4.8 Now the benefits and costs for different qualifications can be brought together by the discounting procedure discussed in section 3. Some results are summarized in Table 8. These are grouped in two ways—*incremental* and *average* rates. *Incremental rates of return* show the return on social investment at each additional level of education, and relate the return on two adjacent qualifications. In so far as policy options arise at the margin, where there is a choice between for example expanding postgraduate more than undergraduate provision, then it is these rates of return which provide a useful method of evaluating the relative costs and benefits. *Average rates of return* show the overall returns on two adjacent qualifications when it might be difficult or indeed impossible to obtain one without the other, for example first degrees cannot usually be obtained without A levels, and it could be argued that there is some element of joint production. In other words,

TABLE 8 Social rates of return on educational qualifications for men* 1966-7 (per cent)

Educational qualifications	With no ability adjustment	With an ability adjustment
Incremental returns:†		
A level	7.5	7.0
First degrees	11.0	9.0
Master's degrees	1.0	<0.0
Doctorate degrees	1.5	<0.0
ONC	8.0	7.0
HNC	>20.0	>20.0
HNC with professional qualification	20.0	16.0
Average returns:‡		
A level	7.5	7.0
First degrees	9.5	8.0
Master's degrees	7.5	6.0
Doctorate degrees	6.5	5.5
ONC	8.0	7.0
HNC	14.5	12.0
HNC with professional qualification	15.5	13.0

* These are returns based on costs including research expenditure.

† Return on the lower adjacent qualification.

‡ Return on a minimum school-leaving age of 15 years, i.e. no qualification at all.

SOURCE: Morris, V. and Ziderman, A., op. cit. (figures are rounded).

from a policy point of view, if it were decided to provide additional undergraduate education this would necessarily incur additional provision for students taking A-level examinations. Here it is the combined return on the joint qualification which is relevant.

4.9 Table 8 shows that:

(i) returns on part-time qualifications are substantially higher than on full-time qualifications, reflecting the fact that despite the lower earnings obtained from part-time qualifications these are more than compensated for by the low direct and especially the low indirect costs;

(ii) rates of return are greater on higher qualifications than entry qualifications—for example, the return on A levels is about 7.5 per cent, whereas the increase on first degrees over A levels is about 11 per cent—an even more substantial increase is shown on the part-time qualifications;

(iii) returns are very low on postgraduate levels of education, reflecting the substantial increase in costs not being sufficiently offset by additional benefits;

(iv) the effect of treating qualifications as joint products is to reduce the differences between levels;

eading 5 You should now read V. Morris and A. Ziderman (1971) 'The economic return on investment in higher education in England and Wales', *Economic Trends*, London, HMSO.

Self-assessment Question 10

Having read the Morris and Ziderman article, answer the following questions:

(i) Which specific occupational groups were excluded from the analysis?

(ii) Why were these groups excluded?

(iii) What is the explanation for the high social rates of return on part-time qualifications?

(iv) What is the explanation for the low rate of return on postgraduate qualifications?

(v) Did the authors make any allowance for the social and environmental influences on earnings of the highly qualified?

(vi) If so, what allowance was made, and how does it affect the results?

(vii) What corrections did Morris and Ziderman make for: survival, unemployment, and non-participation in the labour force? What is odd about the correction for unemployment?

(viii) Why are the average and incremental social returns the same for A levels?

(ix) Why are the average returns lower than the incremental returns on a first degree?

(x) How would you interpret these cost-benefit results if you were using them to advise a government on how to optimize its expenditure? Suggest three conclusions which you might draw.

4.10 You will have noticed that all the cost-benefit analyses discussed here do not make any reference to the distinction between costs which include and exclude an allowance for research. You will recall that this distinction is sometimes made because it is thought that in higher education teaching and research activities can be separated. Indeed, Ziderman and myself attempted to make this distinction in the article you have just read. My own personal view is that teaching and research are really joint products, and if you are interested in this discussion—which recurs in Block III—you should re-read the relevant section in the set reading and observe the differences which excluding research costs can make to the results.

Social rates of return for different subjects

4.11 Now let us look at the evidence on the returns to society from investment in different subjects at the same qualification level. We will concentrate on two qualifications, first degrees and postgraduate degrees, because the most significant choices about resource allocation arise in respect to the distribution of university places between science and arts subjects, where—as you have already observed from Table 4—there are large differences in the social costs of provision. Investing in arts and social science places incurs much lower social expenditure than investing in science or technology places.

The direct benefits

4.12 These data are derived from the same source as those for the education qualification, namely the follow-up survey to the 1966 Sample Census of Population; and the same assumptions are also made in using this data, namely, that earnings approximate to marginal productivity and that cross-section data can be taken as a proxy for lifetime earnings. Once again, the difficulties of measuring indirect consumption and external benefits in monetary terms mean that only the direct economic benefits are included. The annual earnings for first-degree graduates were shown in Table 2; both these age-earnings profiles and corresponding profiles for postgraduates are illustrated in Figures 6 and 7.

4.13 Comparison between the different subject disciplines in Figures 6 and 7 shows the following characteristics:

(i) graduates in arts and social science subjects tend to earn more on average than those in science and technology—the overall average earnings of science and technology graduates is £2,500. The difference is not great but is noticeable;

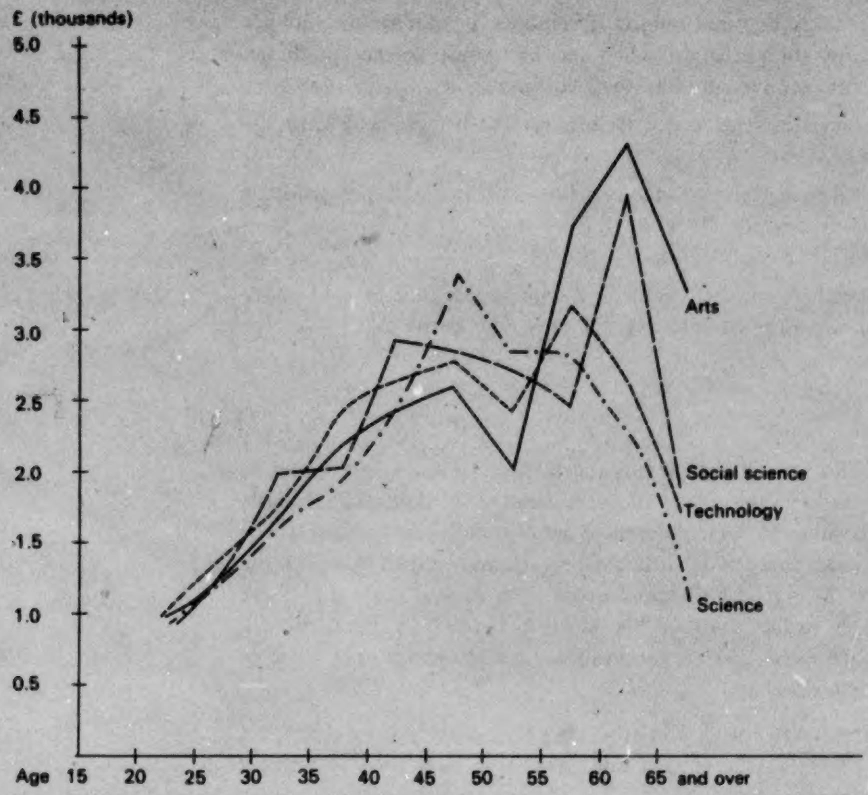

Figure 6 Age–earnings profiles of first degrees by subject (mean annual earnings 1966–7)
SOURCE: Morris, V., op. cit. (Table 2).

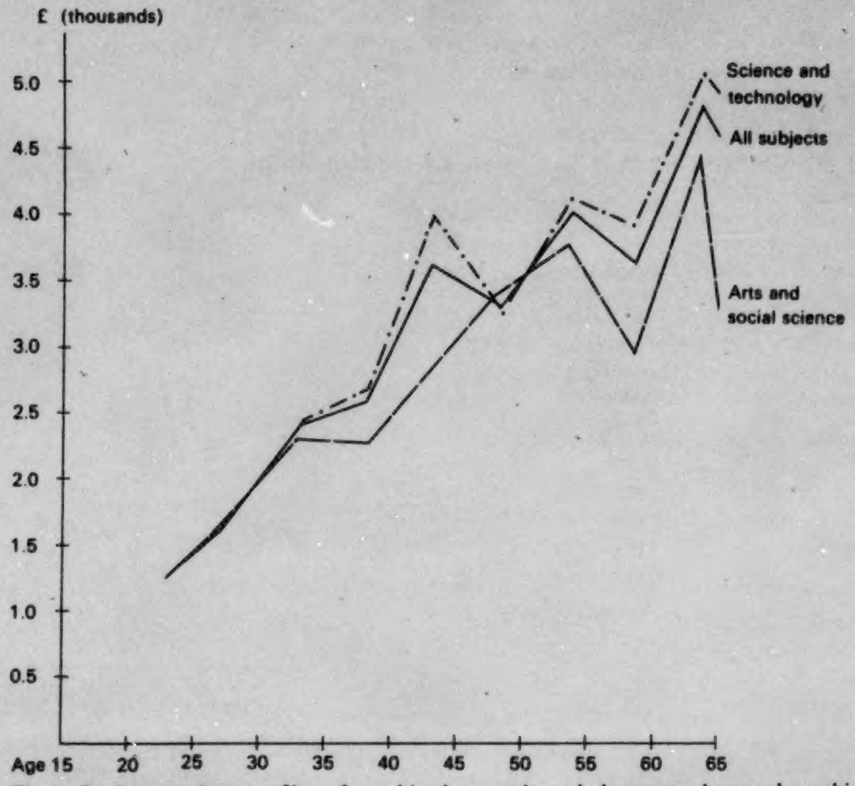

Figure 7 Age–earnings profiles of combined master's and doctorate degrees by subject (mean annual earnings 1966–7)
SOURCE: Morris, V., op. cit. (Table 2).

(ii) the difference in earnings between subject disciplines is narrow at younger ages but increases after the age of 40, when arts and social science graduates earn considerably more on average than their colleagues in science;

(iii) it appears that graduates in science and technology reach their peak earnings earlier than graduates in arts;

(iv) by contrast with first-degree graduates, the benefits associated with postgraduate science and technology degrees are greater than those associated with postgraduate arts and social science degrees;

(v) the postgraduate earnings in each subject discipline are higher and more peaky than those for holders of first degrees only; the earnings profile also peaks later.

The costs

4.14 The costs associated with each subject are summarized in Tables 4 and 5, and as we have already noted earlier they reflect the very substantial difference in costs between science and arts subjects; these differences are especially marked if research costs are included, because there is so much more research expenditure in the sciences than in the arts. It is in the direct recurrent and capital costs that there are significant differences rather than in the indirect costs (forgone earnings). Moreover, the additional subject costs of postgraduate qualifications over those of first degrees are quite considerable.

4.15 Before looking at paragraph 4.16 you should think about the effect you would expect these cost differences to have on the subject rates of return. Now look at Table 9 and see if you were correct.

The rates of return

4.16 The rates of return based on the benefits and costs are shown in Table 9. Among the most noticeable conclusions are the following:

(i) The return on arts and social science subjects is greater than science and technology, reflecting the fact that the higher costs in the science subjects are not offset by extra benefits.

TABLE 9 Social rates of return on different subjects – incremental comparisons for men 1966-7 (percentages)

Educational qualification and subject	No adjustment for ability Excluding research costs	 Including research costs
First degrees:		
Arts	13.5	12.5
Social science	13.0	12.0
Science	11.0	10.0
Technology	11.5	10.0
Postgraduate degrees:		
Master's and doctorate degree:		
Arts and social science	1.0	0.0
Master's degree:		
Science and technology	4.0	3.0
Doctorate degree:		
Science and technology	2.0	1.0

SOURCE: Morris, V., op. cit. (Table 2).

(ii) At the postgraduate level this pattern is reversed, with higher returns on science than on arts subjects. A combined postgraduate arts and social science degree yields a return of 1 per cent, while a combined postgraduate degree in science and technology yields a return of between 2 per cent and 4 per cent. At this level apparently the extra earnings benefits do offset the substantially higher costs.

(iii) It is worth noting that the inclusion of research costs does not appear to significantly alter the differential rates of return between subject disciplines.

Reading 6 You should now read Morris, V. (1973) 'Investment in higher education in England and Wales' in *Decision-making in British education.*

Self-assessment Question 11

Having read the article answer the following questions:

(i) Why are the social returns lower for science than arts graduates?

(ii) Why are the returns lower for arts than for science postgraduates?

(iii) What effect does the inclusion of research costs have on the results?

(iv) Do you think research costs should be included or excluded from the calculations? Explain the reason for your answer.

(v) What effect would you expect the inclusion of external benefits to have?

(vi) How would you interpret these results if you were trying to decide what proportion of new university places should be allocated to arts and social science?

The social rates of return for women

4.17 So far we have concentrated on the rates of return for men, but society also invests substantial resources in the education of women. What is the net benefit to society from this investment— is it a waste of money, as has so often been argued, because women drop out of the labour force early and often never re-enter it? Or is it on the contrary a substantial investment in social capital from which present and future generations can expect to derive substantial benefits, and if the latter, how do we measure these external social benefits, which we have so far found so difficult to quantify in monetary terms?

4.18 But for a start let us concentrate—as we have done before—on the direct economic benefits, returning to the indirect social benefits a little later.

The direct benefits

4.19 These benefits are derived from the census survey, shown in Table 1 and illustrated in Figure 8. These show (along with figure 1 in Woodhall's article, which you will be reading later)[6] the following characteristics:

(i) that the earnings of women with first degrees are greater than those of less-qualified women;

(ii) that their earnings are lower than those of men;

(iii) that the age–earnings profile of qualified women has a similar shape to that of men—it increases with age and peaks later than the profile of less-qualified women;

(iv) average earnings for women are about half those for men at the first-degree level, as well as for 'all employees' (this result is in fact also found, though not shown, between the different subject areas).

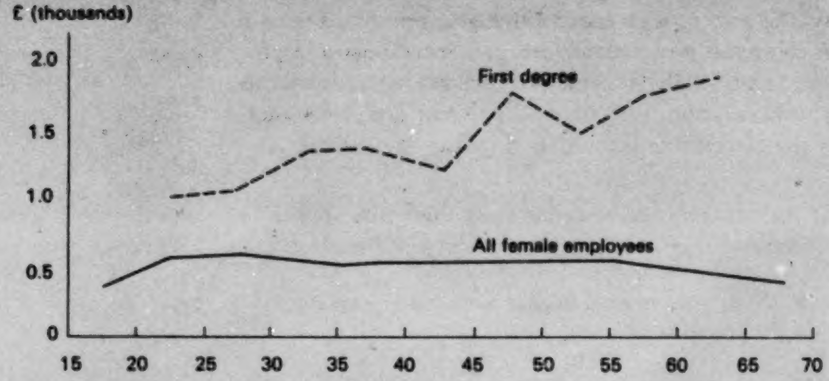

Figure 8 Average annual earnings for women—1966–7
SOURCE: Morris, V. and Ziderman, A., op. cit. (Table 1).

The costs

4.20 The direct costs of women's education closely resemble those of men, so no separate costs were worked out in this particular study. However, the indirect costs are significantly different, and it is these which affect the rate-of-return estimates.

Self-assessment Question 12

(i) Why should the indirect costs be different between men and women?
(ii) What would you expect these differences to be?
(iii) How do you think these differences are likely to affect the rates of return?

The rates of return

4.21 Rates of return for women graduates in different subjects are shown in Table 10. The figures have been calculated to show the effect of including teachers (who have been excluded from all the results we have discussed so far), because so many graduate women enter the teaching profession, thereby substantially improving the representativeness of the data.

TABLE 10 Rates of return (incremental) on investment in women graduates compared with men, 1966-7, per cent*

Educational qualification and subject	Excluding teachers		Including teachers	
	Women	Men	Women	Men
First degree				
All subjects	6.5	12.0	7.0	11.5
Arts	7.0	13.5	7.0	11.0
Social science	10.5	13.0	10.0	12.0
Science	<0.0	11.0	7.5	(11.0)
Technology	—	11.5	—	11.0

*Excluding research cost, no adjustment for ability.

SOURCE: Morris, V., op. cit. (Table 2).

4.22 We have seen that women earn less than men, but it does not follow just because women's earnings are below those of men that the rates of return will show similar differences.[7] This is because rates of return are calculated by *differential* earnings benefits between two educational levels.

4.23 The results do show lower rates of return on women's education than on men's, though the inclusion of teachers reduces the returns for men and increases the returns for women.

Self-assessment Question 13

(i) Why does including teachers reduce the rates of return on men's education?

(ii) What policy inference would you draw from these results if you wished to optimize social benefits from social investment in education?

Indirect benefits

4.24 But as we saw in paragraph 4.17, the question of whether investment in education is less profitable for women than men is more complicated than the difference in the rates of return might suggest. The case studies discussed here have so far been narrowly confined to measuring the measurable, i.e. on the direct benefits associated with investment in education; this is partly because of the considerable difficulties involved in placing a monetary value on, for example, externalities. However, these *externalities* associated with educational investment are likely to be especially important in women's education. There are, for example, the effects on increasing the productivity of future generations, by having more highly qualified mothers. Moreover there is the value of non-market work. Unfortunately there are considerable difficulties in valuing non-market work. One method adopted by Colin Clark was to use public authorities' welfare expenditure to estimate the costs of providing for children in institutions as a proxy for the value of housewives' services.[8] Another method is to price each activity undertaken by the housewife separately in terms of the wages that it would command in the market, such as the earnings of domestic workers, cooks, or child nurses, and yet another to measure the opportunity cost of women's time devoted to child care by her forgone earnings. But all of these are unsatisfactory expedients to deal with the valuation problem.

4.25 No allowance has been made for what might be thought to be the similar effects of discrimination—against, for example, women who may be prepared to work for less than the marginal productivity because the consumption benefits derived from the satisfaction of working are great.

4.26 But all this amounts to saying that in the case of women, rates of return based on direct economic benefits alone may be a very poor measure of social benefit, and that here there is an especially strong argument for undertaking a full cost-benefit analysis before making policy interpretations from the data.

Reading 7 You should now read Woodhall, M. 'The economic returns to investment in women's education'.

Self-assessment Question 14

Do you agree with the statement 'changes in traditional attitudes towards the education, training and employment of women will bring many benefits, not least an increase in the social and private rates of return to women's education'?

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5 Social and private rates of return

5.1 We are now in a position to compare the returns on investment in education to society and to the individual. The results of these returns to different educational qualifications are summarized in Table 11, which shows that the social rates of return are generally lower than the private. This is because although the social benefits are generally higher than the private (being based on differential earnings gross of direct tax), the social resource costs are also substantially higher, and are greater than these extra social benefits. As the extra social benefits occur in the future, they are therefore heavily discounted by comparison with the extra social costs which are largely incurred in the initial period of calculation.

TABLE 11 Social and private rates of return by educational qualification (men), 1966–7 (percentages).

Educational qualification	Social returns	Private returns
First degree/ A level	12.0	22.5
Master's degree/ first degree	2.0	20.0
Doctorate/first degree	2.5	19.5

SOURCES: Morris, V. and Ziderman, A., op. cit. (Table 1); Ziderman, A. (July 1973) 'Does it pay to take a degree?', *Oxford Economic Papers*, table II.

5.2 At the same time neither of these calculations include estimates of the external benefits of education; the effect of their inclusion would certainly be to increase the social rate of return but may not be sufficient to equalize or surpass the private rate. The inclusion of the cost of leisure-time might on the other hand have the effect of reducing the private rate of return, thereby reinforcing the equalizing effects. In the absence of any estimates for these externalities, it is difficult to know what the final effect might be.

6 Some implications of the rates of return for policy

6.1 We now return to the questions raised at the beginning of our discussion and reconsider them in the light of the evidence:

(i) Just how useful are calculations of social rates of return in a policy-making context?

(ii) What particular issues are they most helpful in identifying?

(iii) Are they sufficiently reliable to justify inclusion in policy analysis for decision-making purposes?

6.2 A number of quite specific points have been made throughout this discussion which it is important to bear in mind when evaluating the contribution of cost-benefit analysis to the framework in which educational decisions are made. First, these social rates of return are a measure of only the direct economic effects of educational provision. Next, they relate more specifically to problems of allocation and valuation than distributional issues; they are directed to questions of efficiency rather than equity. The most that cost–benefit analysis can do within a social-policy area such as education is to provide economic guidelines to policy issues.

6.3 Finally, social rates of return do not take into account objectives for education policy other than economic ones, such as social or cultural objectives. At the same time it is important to remember that cost–benefit analysis is not intended to include wide-ranging costs or benefits which can hardly be identified—let alone measured.

6.4 The two specific problems to which attention was directed at the beginning, in relation to the appropriate allocation of resources in the non-market sector of the economy, were:

(i) *the allocation of resources between programmes* within the public sector, i.e. the total resources which should be made available to education;

(ii) *the allocation of resources within the education sector*, where the total resources to be allocated to the education programme have already been decided upon.

Allocation of resources between programmes

6.5 The difficulty with this type of question is that in many ways it is not one which cost–benefit analysis is designed to answer, for example the total resources allocated to the health or transport programmes are unlikely to be decided only by the results of cost–benefit analysis—nor is there any reason to suppose that it would be in the education programmes.

6.6 Cost–benefit analysis is really directed to comparisons between the returns on different projects, and even these comparisons between projects in entirely different branches of economic activity are unlikely to be as useful as those between projects in the same branch. There is the particular difficulty in education of valuing externalities, so that to compare the social rates of return in education with another programme where externalities have been included would not be very meaningful either.

6.7 There is also the question of what to take as the standard of comparison in order to decide whether there is over- or under-investment in education. Should this be determined by what is called the 'social opportunity cost of capital in the public sector'—i.e. the value to society of what might be obtained from the next best alternative investment? We do not need to discuss this problem at length here; we only need say that the social opportunity cost of capital is usually derived from the return on capital in the private sector. While this might be an appropriate rate for deciding actual investment projects in the nationalized industries there may well be less cause for using it in social-policy areas such as health or education where there is no market pricing system and where a series of value-judgements are involved. Consequently it might be argued that even if the results were to show that overall investment in higher education yields a return of 15 per cent compared with (say) 3 per cent return in the railways, this would not be a sufficient condition for the reallocation of resources between the two sectors.

Allocation of resources within the education programme

6.8 The social rates of return show a wide range of investment opportunities available to governments for deciding the appropriate scale and type of educational provision and are, for example, relevant to decisions affecting increases or decreases of expenditure at the margin. They illustrate the relationship between the costs and economic benefits associated with various educational programmes and help to demonstrate the implications of some policy options open to governments in allocating resources between educational sectors: for example, between universities and polytechnics; between different types of course such as full-time and part-time training; and between subject disciplines. Comparison of successive levels also shows the economic benefits associated with each additional qualification, such as the option to continue university education after the first degree to master or doctorate levels. From the point of view of policy analysis it is probably most useful to consider the returns on adjacent qualification levels within each sector, since it is these incremental rates of return that most accurately reflect the policy options open to governments for changing expenditure at the margin, for example increasing that on university undergraduate education while reducing that on postgraduate education.

6.9 But questions of whether or not to expand the whole of the education programme for the 16–18 age-group or the 18–21 age-group are so large that they are likely to have non-marginal effects, and changes such as these cannot easily be fitted into the marginal framework of 'other things being equal'. We shall therefore concentrate on the policy implications of the marginal rates of return.

6.10 One final point before turning to evaluation of the evidence for the policy issues we are discussing: it is likely that the non-inclusion of externalities will prove a less severe problem where comparisons are made within a programme (such as education) than between different types of programme. Comparisons between levels of education and qualifications tend to reflect the way in which decisions are actually made in education.

6.11 Among the policy questions are the following:

(i) *Allocation of resources between educational qualifications*

6.12 What do the results tell us about over- or under-investment between educational levels?

The returns on the first stage in higher education (either first degrees or professional training) over the necessary entry qualifications (A levels or ONC) suggest that this first stage is relatively profitable, i.e. the rate of return on a first degree is 12 per cent compared with 7.5 per cent on A levels, and the return on an HNC is 10 per cent compared with a return of 8 per cent on an ONC. But comparison of the return on postgraduate degrees (master's and doctorates) with first degrees shows relatively low returns, suggesting over-investment, and certainly that further investment in postgraduate education would not be a profitable social investment. The absence of an allowance for the value of the addition to knowledge from postgraduate education means that these rates of return (reflecting only the direct economic benefits) may be underestimates.

However, you may object that it is not possible to obtain either a degree or an HNC without first gaining the necessary qualifications of A levels or ONC—in other words the policy issue is not whether to expand provision at 16–18 or to expand it at 18–21, but whether to expand both because they are joint products. If this is the policy issue then it is the overall or average comparisons which are relevant rather than the incremental comparisons. In fact this comparison shows a narrower differential, although part-time qualifications are still higher. The conclusion may still therefore be to expand part-time HNC rather than first degree, but by relatively less.

These are only very broad indications of the kind of conclusions that can be drawn from the evidence on social rates of return to different levels of qualification, but they help to illustrate the importance of first defining the policy question which is being asked.

(ii) *Allocation between different types of education*

6.13 Should society invest in full-time or part-time education?

Most of the results we have here only compare alternative routes through full-time and part-time education. These suggest that investment in a Higher National Certificate or a Higher National Diploma is significantly more profitable as an investment than the return on full-time qualifications. This reflects the substantial cost differences between part- and full-time education, the higher cost of full-time education not being sufficiently offset by increased direct economic benefits. The inference for society is that it is more profitable to invest national resources in part-time courses of a kind provided at the polytechnics than in university degree courses.

(iii) *Allocation between different subjects*

6.14 What do comparisons between the returns in the arts and sciences tell us about the relative distribution of places?

The results show higher returns on arts and social science first degrees than science and technology first degrees, thereby arguing for some reallocation of resources—expanding the places in arts and social science while reducing those in science and technology. The results reflect the fact that higher public expenditure in the sciences is not offset by higher economic benefits. But the results are reversed at the postgraduate level, where the returns on science and technology higher degrees are greater than those for arts and social science; nevertheless both sets of returns are relatively low by comparison with those on first degrees.

(iv) *Resources for men and women*

6.15 Are the returns on social investment for women significantly lower than for men?

The results certainly show that returns on women's education are significantly less than for men. However, the exclusion of externalities and the value of non-market work could well make a significant difference to these results. This emphasizes the importance of attempting to incorporate the consumption and indirect benefits of education into the cost-benefit framework, since it is probable that these may be greater for women than for men.

(v) *Teaching and research*

6.16 Should research be concentrated in a few universities of excellence, leaving most other universities to do teaching alone?

The results show that the effect of excluding research costs is to increase the rate of return. This comparison may well be appropriate where no allowance can be made for the benefits of research. However, the problem is again one of joint products.

Implications for the policy-maker

6.17 The general message of these results is fairly clear: expand part-time education; cut back on postgraduate education; shift resources out of science and technology into arts and social science; reduce investment in women's education; and cut back on research.

6.18 But the question is whether the policy-maker should be at all influenced by these results, and if so by how much? Remembering that we are only interested at the moment in the economic objectives of efficient allocation of resources between different educational sectors, the question is, what guide do the results provide on reallocation? The absence of any valuation for externalities inevitably means that even when comparing returns within the educational sector they are limited. Nevertheless, given that these results refer to the late 1960s, they confirm some then-current impressions that postgraduate education had been over-expanded, as had provision in science and technology, where places were not being taken up.

6.19 It is also possible that rate-of-return analysis will be more useful in some areas than in others, where the inclusion of externalities is likely to bias the results, for example in questions of allocation between men's and women's education. The fact that all these externalities cannot be included is not peculiar to education. It is a general problem common to all cost–benefit analysis, and a problem for all public investment. This means that rate-of-return analysis can only provide one of many guides that the policy-maker will need to take into account in terms of the general objectives of educational policy at any given time.

6.20 The returns discussed here represent an evaluation of a wide range of investment opportunities open to government: they illustrate the costs and benefits associated with alternative policy options and different expenditure programmes. The results are inevitably tentative, and need to be interpreted carefully, but nevertheless they do provide economic indicators that have policy implications. It is of course the relative rather than the absolute magnitude of the returns which may be interpreted as indicators of economic value to society of investment in education, and most of the investments are only relevant to marginal changes.

6.21 As we shall see later, changes in the supply or demand for qualified manpower may be expected to alter relative earnings differentials, so affecting the rate-of-return estimates. It is for this reason that cost–benefit analysis might be usefully combined with labour-market supply-and-demand analysis of qualified persons, along with a social-demand approach to educational planning. The advantage of combining rate-of-return analysis in this way is that it would bring the costs of education explicitly into a manpower-planning framework. It is likely that such a combined approach linking education output to the employment market would be especially useful and relevant to higher-education policy (though perhaps almost equally important for the 16–19 age-group). These issues are taken up in the following paper by Maureen Woodhall, and again in Paper 3 by Adam Westoby.

Answers to self-assessment questions

Self-assessment Question 1

(i) The following may be reasons why cost–benefit analysis is undertaken:

  (a) a proposed cutback in total public expenditure—these cuts having to be allocated between government departments;

  (b) proposals to increase the education expenditure on women's education;

  (c) proposals to increase vocational or technical training via apprenticeship schemes, while cutting back on education expenditure.

(ii) The following issues might be investigated:

  (a) expansion of provision for the 16–19 age-group;

  (b) expansion or reduction in nursery provision on a regional basis;

  (c) expansion or contraction of postgraduate *vis-à-vis* first-degree qualifications.

Self-assessment Question 2

(i) The profiles are similar in the following ways:

  (a) they increase with age;

  (b) they peak between 40 years and 60 years, then decline.

(ii) The profiles are dissimilar only in so far as they show greater dispersion of earnings between subjects.

Self-assessment Question 3

There was no equilibrium price because at £10 a week 90 men were offered employment by industry, but only 30 men sought employment. A process of bargaining was therefore necessary, industry offering a higher wage, but employing fewer men; while more men offered themselves for employment as the wage-rate increased. Finally the equilibrium price was reached, as shown in Figure 4.

Self-assessment Question 4

(i) Earnings would be greater than the workers' marginal product in the short run.

(ii) The outcome would depend on whether earnings for men and women doctors were jointly or separately negotiated; and whether there were different demand schedules for men and women doctors. In a perfectly competitive market, where the demand for men and women doctors was identical, there is no reason to suppose women doctors would earn more than men. But a greater demand for women doctors along with these entry restrictions might result in their earnings being greater than their marginal productivity.

(iii) Earnings might be below marginal productivity.

Self-assessment Question 5

(i) non-pecuniary consumption benefit
(ii) non-pecuniary consumption benefit
(iii) externality
(iv) fringe benefit
(v) indirect monetary benefit
(vi) non-pecuniary consumption benefit
(vii) fringe benefit
(viii) consumption benefit
(ix) consumption benefit
(x) direct monetary benefit

Self-assessment Question 6

You should mention transfer payments such as grants (excluded from social costs), and direct expenditure, i.e. recurrent and capital costs (excluded from private costs).

Self-assessment Question 7

(i) A first degree in arts—£6,732
in science—£7,759.

A master's degree in arts and social science—£12,078 (based on averaging the costs of first degrees in arts and social science).

(ii) The effect would be to reduce both the direct and total resource cumulative costs, since schooling to 16 years is no longer an option, but incurs compulsory government expenditure.

Self-assessment Question 8

The main point is that while the highly paid have a number of favourable socio-economic characteristics, these are not sufficient in themselves to explain the association between the highly qualified and highly paid. The explanation, it is implied, lies in the increased output of the more highly educated.

Self-assessment Question 9

(i) The return on a first degree in technology is 11.0 per cent.

(ii) The return on a master's degree in technology (and science) is 4.5 per cent;

(iii) The return on a PhD is 2.5 per cent.

Self-assessment Question 10

(i) Doctors, dentists, accountants, solicitors, schoolteachers, clergy, armed services, civil servants.

(ii) Doctors, dentists, accountants, and solicitors were excluded because the costs involved in qualifying are additional to full-time education costs, for example on-the-job training, evening courses and so on. These groups also exercise monopoly power.

Teachers, clergy and armed forces were excluded because they enjoy (or are supposed to enjoy) certain non-pecuniary benefits.

Civil servants were excluded because of the existence of certain monopsony power.

(iii) Although the social benefits of part-time technical qualifications are below those of full-time qualifications, the social costs of part-time qualifications are so much lower than full-time course costs that they lead to these higher rates of return.

- (iv) The social costs of postgraduate qualifications are very much greater than first-degree costs, and the social benefits are not sufficiently high to outweigh these costs.
- (v) Yes.
- (vi) They took 0.66 per cent of earnings as being attributable to extra education. The effect of this adjustment is to reduce the rates of return—but not by one-third, since it is the earnings *differential* which is adjusted.
- (vii) You should check your answer with the fifth page of the article.
- (viii) Both are measured by including O-level costs.
- (ix) The average returns are low on first degrees because they include A-level social costs and benefits: and the social costs are higher.
- (x) You might use this evidence to suggest:
  - (a) reducing expenditure on postgraduate education;
  - (b) increasing expenditure on part-time technical education;
  - (c) reducing expenditure (were it possible) on research.

Self-assessment Question 11

- (i) The lower returns are ascribed to the higher science-course costs not being offset by higher social benefits.
- (ii) The lower returns are explained by the lower social benefits.
- (iii) Including research reduces the social rates of return.
- (iv) This answer will depend partly on your own evaluation of the contribution research experience makes to the productivity of a teacher.
- (v) These might be expected to increase the social rates of return.
- (vi) Probably reduce the number of undergraduate places in science and technology, while increasing the places in arts and social science; and at postgraduate level possibly to expand places in science and technology while decreasing those in arts and social science.

Self-assessment Question 12

- (i) The forgone earnings are different.
- (ii) Women's forgone earnings are less than men's.
- (iii) These indirect costs, being lower than for men, might have the effect of producing somewhat higher rates of return than might be anticipated at a first glance.

Self-assessment Question 13

- (i) Men teachers earn below the average earnings of qualified men in other occupations (in 1968), thereby reducing the social benefits.
- (ii) You might decide to reduce expenditure on women's education.

Self-assessment Question 14

The case could be argued either way, but it seems likely that were a full cost-benefit study to be undertaken, including the consumption benefits and externalities, that both the private and social rates of return might be greater. You should refer to paragraphs 2.37–2.52 in the text.

PAPER 2

MANPOWER PLANNING AND THE DEMAND FOR QUALIFIED MANPOWER

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prepared by Maureen Woodhall

Objectives

By the time you have finished this paper you should be able to:

- distinguish between different usages of the terms manpower 'requirements' and 'needs';
- state the major assumptions of manpower forecasting;
- examine them critically, to see whether they are realistic;
- give a broad outline of some of the main methods that have been used to prepare forecasts of manpower requirements;
- compare the assumptions of manpower forecasting with those of the rate-of-return analysis discussed in the previous paper;
- decide on what basis manpower forecasts ought to be evaluated;
- apply these criteria to British forecasts of scientific manpower and of teachers;
- evaluate, on the basis of your reading, how helpful manpower forecasts have been for educational policy decisions in Britain;
- distinguish between arguments in favour of manpower *forecasting* and arguments in favour of manpower *planning*;
- discuss what the main objectives of British manpower planning should be, if it is to contribute effectively to educational policy-making.

1 Introduction

The rationale for manpower planning

1.1 By now you will have encountered in many different forms the idea that the development of the education system should be planned according to a formulation of society's needs, rather than simply in response to individual demand. One of the most direct ways in which education satisfies the needs of the economy is by providing future workers with skills, knowledge and attitudes that they will use in their productive lives. Therefore, an obvious and instantly appealing method of determining educational targets would be to specify a desired manpower structure for the economy, in terms of numbers of workers with particular skills, and then to ensure that the education system produced neither too many nor too few people with the necessary educational qualifications.

1.2 The idea that it is possible to forecast or project a country's manpower structure, and then to use the result as a basis for planning the scale of education, is not only appealing at first sight, since it appears to offer the hope of unambiguous guidance to the policy-makers on one aspect of 'society's needs'; it has also exerted a powerful influence over educational planning in many countries, over a number of years. (In the next few pages the words 'forecast' and 'project' are used without clarification of whether the forecasts are conditional or unconditional. This is because the literature on the subject frequently confuses the two uses of the word 'forecast'. The point is taken up in paragraph 2.12.)

1.3 In Chapter 5 of the set book, Blaug describes the process of forecasting manpower requirements as 'the leading method throughout the world for integrating educational and economic planning' (p. 137). This description draws not on a review of academic literature, but on a UNESCO survey, which revealed that sixty different countries had drawn up an educational plan based upon an investigation of manpower needs. In most cases the first investigation was made between 1964 and 1967. These dates suggest that manpower forecasting is a fairly new activity, and certainly most attempts to forecast the entire manpower structure of a country date from the 1960s. However, attempts to project numbers in certain special occupational categories—notably those of doctors, teachers, scientists and engineers—have a longer history.

1.4 In Britain, the National Advisory Council on the Training and Supply of Teachers produced forecasts of the demand for teachers in 1956, and in the same year, the Committee on Scientific Manpower produced its first long-term forecast of requirements for scientists and technologists. Although neither committee was set up solely to provide targets for educational planning, their forecasts did influence policy decisions—for example, on the length of training for teachers and the balance between arts and science faculties in universities. Another forecast, produced about the same time, was specifically intended to provide guidance on numbers of student places. This was the work of the committee set up by the Ministry of Health to forecast the demand for doctors, and the 'consequential intake of medical students required'. This committee reported in 1957, and its forecasts were used as the basis for planning places in medical schools until they were replaced by forecasts by the Royal Commission on Medical Education in 1968. Later in this paper we shall look in some detail at British experience of forecasting requirements for teachers, and for scientists and engineers, and television programme 3 will look at forecasts of numbers of doctors.

1.5 Even though all these early attempts to project requirements of specialized manpower revealed formidable problems, the idea that manpower needs can be forecast or predicted, and the forecasts used to determine educational targets, has remained popular.

1.6 The Robbins Committee rejected the notion that estimates of the number of places to be provided for students in higher education should be based explicitly on 'corresponding estimates of the eventual demand for their services',[9] on the grounds that the difficulties involved in making quantitative projections of manpower needs were too great. Nevertheless, even while it confessed itself unable to surmount these practical difficulties, the Committee may have fostered the idea that educational targets should be determined by manpower requirements, when it justified its estimates of the number of places:

> Meanwhile we wish to state unequivocally that—always provided that the training is suitable—there is a broad connection between the size of the stock of trained manpower in a community and its level of productivity per head. Doubtless there is some ambiguity here. For it is certainly true the richer a community the more education it wants and can afford. But if productivity is to advance at anything like the rate now deemed desirable there is a strong presumption that a substantial increase in the proportion of the population that is both skilled and versatile will be necessary. And in modern societies the skills and the versatilities required are increasingly those conferred by higher education. Indeed, unless this country is prepared to expand higher education on something like the scale we recommend, continued economic growth on the scale of the targets set by the National Economic Development Council is, in our view, unlikely to be attainable.[10]

1.7 This passage closely follows a careful summary of the problems of predicting needs for qualified manpower, but even so appears to accept two of the central assumptions of manpower forecasting, namely that there is an identifiable link between the qualifications of workers and their level of output, and that economic growth targets give rise to a 'need' or 'requirement' for particular types, and numbers, of qualified workers.

1.8 In the 1960s these two arguments were used to support the idea that educational planning should be based on detailed manpower forecasts, to prevent shortages of skilled manpower that would make the desired rate of economic growth impossible. More recently, manpower forecasting has been suggested as a means of avoiding a surplus of qualified manpower, or any type of 'mismatch' between demand and supply. (The term 'mismatch' has been used in recent years to refer to an imbalance between the output of the education system and the demand or needs of the labour market.) For instance, in 1975 Lord Crowther-Hunt argued that manpower planning is particularly important at a time of financial and economic difficulty:

> It simply will not do to allow universities and polytechnics to produce whatever people they fancy or to relate the number and kind of places they provide to the applicants that come forward. . . We need to be more than ever certain that the money we spend is well spent, which means in my view that we should do our best to produce the sort of educated people the nation needs. We need to estimate our likely future needs for different broad categories of trained manpower, drawing from the experience of some of our industrial competitors.
>
> . . . Attempts at manpower planning in this country in most fields are of no very great age and have so far not been all that sophisticated. I am not deterred, therefore, from pursuing further a positive approach to higher educated manpower that would look again at what might be the needs of the economic system and to ask questions not simply about the numbers of qualified people but the nature of their qualifications.[11]

The 'manpower-forecasting' approach versus the 'human-capital' approach

1.9 No one would disagree that it is essential that money devoted to education is well spent, or that we need to ask questions about the needs of the economic system and about the types and numbers of qualified workers that the education system produces. There is, however, fierce disagreement about the questions that ought to be asked, and the methods for judging whether the money is well spent, and whether the education system is providing a labour force with the right skills. Even those who admit the need for some sort of manpower planning disagree about the information needed, and about the appropriate techniques to use—in particular, whether forecasting is a necessary element.

1.10 When this paper was written (summer 1976) the controversy was being aired forcibly by two leading figures in educational policy: Lord Crowther-Hunt, whose views are summarized in the extract above, and Gerald Fowler, who succeeded him as Minister of State for Higher Education early in 1976. Crowther-Hunt has made a number of public declarations in favour of what he terms 'broad-brush' manpower forecasting. This he defines as the preparation of a 'broad category manpower budget . . . which would indicate for 10 years or more ahead the country's likely need for such categories as scientists, engineers, technicians and so on'.[12] On the other hand, his successor has declared: 'A detailed manpower policy, in the sense of organizing courses of education so as to match with precision the forecast needs of employers for trained personnel of various types is not a practical proposition, even if it were desirable. We can neither predict demand, nor manipulate supply with enough precision for that purpose.'[13] The controversy has been treated by commentators as a clash of views on the flexibility or desirability of basing educational planning on manpower forecasts, although Crowther-Hunt stressed that he was advocating a very much broader and more comprehensive approach, dealing with 'the whole area of highly trained manpower', rather than the approach 'cast in specific and relatively narrow occupational terms' attacked by Fowler. In other words, there is no agreement about what the questions should be.

1.11 The previous paper examined a possible framework for questions about the 'needs of the economy', based upon the relationship between the costs and the monetary benefits of education, as measured by the social rate of return. If such a framework is adopted, the planner will need to examine estimates of rates of return and information on trends in relative wage levels to see which types of education are the most profitable for society. He will also need to know how profitable education is as a private investment, so that he can judge the responsiveness of private demand to changes in the earnings of educated people, or in the costs of education.

1.12 However, the advocates of manpower forecasting reject this sort of evidence as unreliable. They believe that trends in wages are influenced by so many factors other than demand and supply that they cannot be used to measure the benefits of education, and they argue that even if rates of return are considered meaningful, estimates of the social rate of return to education can, at best, provide only guidance about the 'direction of change' needed. Since rates of return are essentially a tool for evaluating marginal changes, the knowledge that the rate of return to undergraduate education is higher than the rate to postgraduate courses may suggest that facilities for postgraduates should not be expanded as rapidly as those for first-degree students. It gives no indication, however, of the precise number of places that should be provided. Forecasts of manpower needs, on the other hand, do promise to yield firm, numerical targets. Since the expansion or reduction of facilities, particularly in higher education, must be planned many years ahead, being able to specify education targets based on long-term and medium-term forecasts would certainly be valuable, provided that these forecasts could accurately predict the manpower structure in ten or twenty years. (For example, the chairman of the Vice-Chancellors' Committee in 1972 acknowledged 'that if the techniques of manpower forecasting could be improved this would be of enormous benefit in the planning of higher education'.)[14] However, critics of manpower forecasting argue that we can predict accurately for only two or three years, so that the numerical targets offered by manpower forecasts are just as imprecise as the guidance provided by rate-of-return estimates.

1.13 There is, therefore, considerable disagreement among economists about the role of manpower forecasting in formulating educational policy. Those who are committed to the 'manpower-forecasting approach' believe that forecasts of manpower requirements can be accurate enough, and that relationships between the educational qualifications of the labour force, the pattern of occupational distribution and the level of output are stable enough to allow quantitative estimates of manpower needs to be converted directly into targets for the educational system. Those who are opposed to this approach believe that manpower forecasts are inherently unreliable, because a given level of output in the economy can be achieved with a wide variety of manpower structures. Such an argument implies that the only way to judge whether the education system is providing workers with the right combination of skills is by comparing the costs and benefits of different types of education, and studying closely the workings of the labour market for qualified manpower.

1.14 The purpose of this paper is not to resolve this disagreement, which is the source of continuing controversy among economists. Instead, it will examine the assumptions and methods of manpower forecasting, and look at two examples of forecasting demand for specialized manpower in Britain—for teachers and for scientists and engineers—and one example of an ambitious attempt to forecast the whole manpower structure in a number of countries.

2 A guide to terminology and concepts

2.1 So far in the paper I have made no attempt to distinguish between (a) demand for manpower; (b) manpower requirements; and (c) manpower needs. Much of the literature on manpower forecasting does the same. Many writers do make a distinction between *demand* for manpower and *needs* or *requirements* of manpower, but different writers frequently use the terms in different ways, or use them imprecisely, and switch about between them, as if the words were interchangeable. You will find all these terms used in the readings that are recommended in this paper, but sometimes in a confusing way.

2.2 You will also find many examples of the confusion discussed by Gordon and Williams (Block I, Paper 2, paragraphs 2.1–2.10) between (a) projections; (b) forecasts; and (c) targets.

2.3 Rather than attempt a new set of definitions, which might produce more confusion, I want to stress the distinction between statements about:

(i) the *demand* for manpower, in the economist's sense of the term, which is the *number* of workers in a particular category employed at *a given wage-rate* (which economists call 'price');

(ii) the *requirements for* manpower, in the technological sense of the *number* of workers in a particular category *necessary* to achieve a particular level of output, with *a given set of production techniques*;

(iii) *needs* for manpower, in the sense of a target, namely the *number* of workers considered *desirable* to achieve *a given policy objective*; for example to satisfy particular staffing standards—for doctors, teachers, or social workers—or to bring about a change in the balance between scientific and non-scientific manpower in industry.

2.4 The difference between the economic concept of *demand* and the technological concept of *requirements* is emphasized if we look at one of the economist's basic tools, the 'demand curve'. This is the pictorial representation of the principle stated at the beginning of the paper by Gordon and Williams (Block I, Paper 2): 'To an economist the word "demand" has a specific meaning. It is the amount of a commodity that is purchased at a particular price. Thus the demand for beef is the amount of beef that people buy at whatever the current price of beef happens to be. If the price rises, less is bought. If it falls, more is bought.'

2.5 As demonstrated in Paper 3 of Block I (para. 2.2), we can illustrate this fundamental principle by drawing a graph (Figure 9) that shows the price of beef on one axis, and the amount of beef people would be willing to buy on the other.

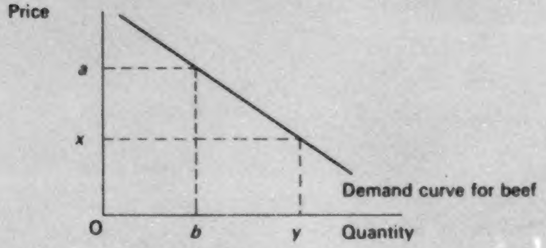

Figure 9

2.6 Figure 9 shows that if the price of beef is high (O*a*), people will buy a relatively small amount (O*b*). If the price is lower (O*x*), they will buy more (O*y*).

At any particular time it may be possible to observe different prices in the market (that is, by comparing prices at a large supermarket and a small family butcher); if the market is highly centralized, there may be one prevailing price. But the demand curve shows the potential responses of consumers to changes in the price of beef.

2.7 As you saw in Block I, it is possible to examine the demand for education by looking at the effect of a change in price (i.e. the private costs to the individual) on the number of people who want to enter a particular level or type of education. A similar graph can be drawn for the demand for manpower (Figure 10).

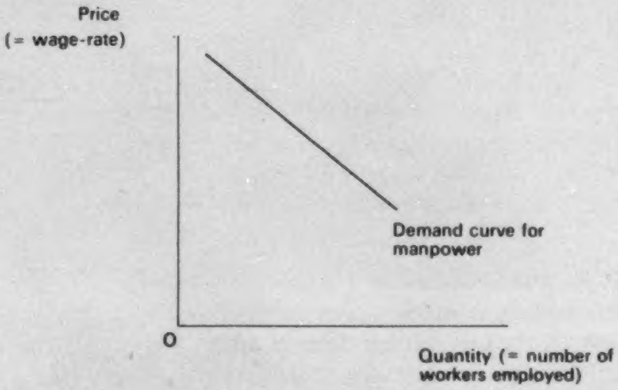

Figure 10

2.8 You need not worry, at this stage, about the precise shape of the curve: whether it is indeed a curve or a straight line, how steep it is, or whether it crosses the axis (that is, whether it makes sense to talk of a zero price or quantity bought). You should simply remember that when talking of 'demand', whether for manpower or for beef, the economist always has a graph of this type at the back of his mind, showing the relationship between the quantity of a product that consumers would be willing to purchase, and the price at which it is offered.

2.9 A similar picture can be constructed of the 'supply curve', to show, in an exactly parallel way, the various amounts that suppliers of beef (or any other product) would be willing to provide, at different prices (Figure 11).

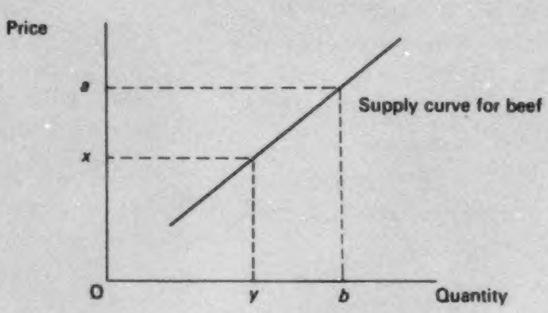

Figure 11

If the price of beef is high (O*a*), farmers are willing to offer a larger number of animals for sale (O*b*) than if the price is lower (O*x*).

2.10 You will see from these two diagrams that when an economist speaks of 'demand', he is concerned with a relationship between quantity and price. More particularly, he is usually concerned with the point at which the demand curve (*D*) and the supply curve (*S*) intersect (*A*), as in Figure 12.

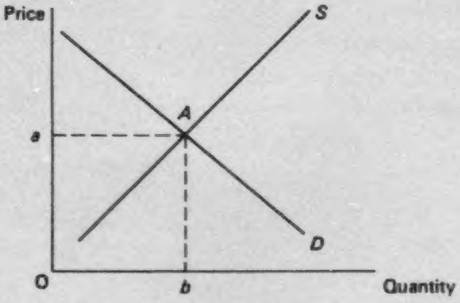

Figure 12

At this point of intersection the quantity consumers are prepared to buy (O*b*) coincides with the quantity suppliers are prepared to sell. The price at *A* (O*a*) is called the 'equilibrium price'. Later on (paragraph 3.14) we deal with what happens if demand and supply are not in equilibrium, in other words if there is a shortage or surplus of the product.

2.11 For the moment the important thing to grasp is the difference between the concept of demand, and the technological concept of the amount of an input necessary to produce a specific output at a given level of technology. This concept depends on the existence of different production techniques, and is not concerned with differences in price.

2.12 You should also remember another important distinction, discussed by Gordon and Williams, between different types of forecast:

(i) *extrapolations*, which assume that a given set of trends will continue;

(ii) *projections, or conditional forecasts*, which assume that a given set of conditions will operate (and which may or may not include a continuation of existing trends);

(iii) *predictions*, which state what is considered the most likely course of events, and therefore which aim to describe the future accurately—these Gordon and Williams describe as 'unconditional forecasts';

(iv) *targets*, which are intended to serve as policy goals, and which the policy-maker may regard as either realistic or optimistic.

2.13 Unfortunately, the literature on manpower forecasting does not observe these distinctions. In particular, the rule suggested by Gordon and Williams is not observed. They suggest, in Block I, Paper 2, paragraph 2.6, that 'if the word "forecast" is not qualified an unconditional forecast is usually implied'. In the literature on manpower forecasting, however, 'forecast' is normally used to mean a conditional forecast—a 'projection' in Gordon and Williams's terminology. To impose new definitions or terminology now would be impossible, particularly since the writers we examine in this paper use different definitions. Moreover, many writers on this subject use the term 'manpower forecasting' regardless of whether they are describing conditional or unconditional forecasts. In this paper I follow this convention, and talk about manpower forecasting as a technique, rather than manpower projecting, although, as we shall see, many of the forecasts are conditional.

2.14 However, provided that you are aware of these distinctions, you should be able to identify the senses in which different writers use the terms, in spite of the variety of definitions. You should also become aware of some hidden contradictions and vaguenesses in the use of the concepts by different writers. These will be very important when we begin to explore the assumptions of manpower forecasting, and attempt to evaluate forecasts. Criticizing a forecast for failing to predict events is pointless, if the forecast was merely intended to spell out the manpower implications of a particular set of assumptions or growth targets; in other words, if it was a projection, rather than an unconditional forecast or prophecy. A forecasting exercise presented as a *prediction* of the likely course of events that turns out to be based upon unrealistically optimistic assumptions may lead to wrong policy decisions. Similarly, a statement about the future manpower structure that purports to project *demand*, but ignores the relative wage levels of different categories of manpower, is likely to prove misleading to policy-makers.

Activity

Is it impossible, then, to compare or evaluate statements about the future manpower structure of the economy without explicit information about the assumptions and purpose of the writer? Consider the following extracts from writings on manpower forecasting, and decide whether:

(i) the writers are drawing attention to the distinctions listed above;

(ii) you would expect demand to be higher or lower than requirements or needs.

> At any time the scale and composition of a country's productive activity, the stage of its technological and managerial evolution and its national economic objectives, give rise to a postulated need for highly qualified skill . . . It is of course possible to satisfy demand without satisfying need.—Committee on

Manpower Resources for Science and Technology (1966) *Report on the 1965 triennial manpower survey of engineers, technologists, scientists and technical supporting staff* (Cmnd 3103), London, HMSO, p. 17.

We do not know how many scientists and technologists are at present required by employers or will be in the future . . . We are however in no doubt that two sectors in particular—industry and the schools—need for their own welfare and that of the economy, a much greater injection of scientists and technologists; and that for most of the 1960's the pattern of employment of graduates in this field, particularly of the most able, has been at variance with this need.—Committee on Manpower Resources for Science and Technology (1968) *The flow into employment of scientists, engineers and technologists* (The Swann Report): (Cmnd 3760), London, HMSO, p. viii.

Manpower forecasts can deal either with needs or with probable demand. Both have their uses, but they must be distinguished. Needs specify what ought to happen; demand relates to what actually occurs, though it may, of course, be wrongly predicted.—C. A. Moser and R. Layard, 'Estimating the need for qualified manpower in Britain' in Blaug, M. (1968) *Economics of education: selected readings, Vol. 1*, Harmondsworth, Penguin Books Ltd.

2.15 The extracts are too brief to convey all the implications of the distinctions being emphasized by each author, although there is clear implication in the first two extracts that 'needs' are greater than 'demand' or even 'requirements'.

They should, however, serve to put you on your guard, particularly when using the set or recommended readings, so that you are aware that the terminology used by different writers may be far from unambiguous. Any statement about the future manpower structure rests upon explicit or implicit assumptions. The next sections of the paper are concerned with these assumptions, and with such questions as:

(i) How realistic are they?

(ii) Are they consistent with the analysis of education as a private and social investment, discussed in the previous papers?

(iii) Do they affect the validity of a forecast or projection as a guide for policy?

3 The assumptions of manpower forecasting

3.1 We are now ready to examine in some detail the assumptions of manpower forecasting, before looking at the methods that have been adopted in producing forecasts. At this stage we are concerned with the possibility of forecasting demand in the whole economy; later we mention the problems of estimating demand by individual firms.

3.2 One of the most influential advocates of manpower forecasting in the early 1960s was Parnes, whose ideas were put into practice by the OECD in the 'Mediterranean Regional Project' (MRP). Detailed forecasts of manpower requirements up to 1975 were drawn up for the six Mediterranean countries: Greece, Italy, Portugal, Spain, Turkey and Yugoslavia. The forecasts were used as a basis for estimating the number of additional places to be provided at each level of education, and the number of teachers and the capital expenditure that would be necessary to produce the desired rate of increase in qualified manpower.

Reading 8 You should now read the extract from the book written by Parnes in 1962, which explains the forecasting methods adopted by the MRP. We shall look in more detail at the methodology of the forecasts in a later section. For the moment, you should concentrate on the general arguments put forward by Parnes in favour of the 'manpower-forecasting approach'. You should pay particular attention to his statements about:

(i) the relative advantages of short- and long-term forecasting;

(ii) the difference between 'demand' and 'requirements';

(iii) the influence of price, and supply, on the demand for manpower;

(iv) the relationship between the occupational structure of the labour force and the level of output.

When you have finished reading the extract you should answer the following questions, and then check your answers with the following section.

Self-assessment Question 1

(i) What time-scale does Parnes advocate for manpower forecasts? How far ahead did the MRP teams seek to project manpower needs?

(ii) Does Parnes recommend that forecasts of manpower requirements should attempt to predict the pattern of relative wage-rates?

(iii) Which of these statements would more correctly summarize the point of view expressed by Parnes:

(a) Since the number of workers employed at a given moment of time is a measure both of supply and demand, and since it is responsive to changes in salary levels, the labour market can be relied upon to eliminate shortages of manpower, but there may be significant time-lags.

(b) Although employers are able to make minor adjustments to production techniques, to overcome a particular shortage of manpower, in general the occupational distribution of the labour force is determined by the level of labour productivity, so that if the target level of output is known, it is possible to estimate the future occupational structure.

The time-scale of manpower forecasting

3.3 Parnes, like most advocates of manpower forecasting, recommends that for purposes of educational planning, forecasts of manpower needs should cover at least ten years, and preferably fifteen or twenty. The MRP exercise attempted fifteen-year forecasts. He recognizes that some accuracy and detail must be sacrificed when forecasts cover such long periods, but regards the sacrifice as inevitable, given the time needed to train high-level manpower.

3.4 This is one of the fundamental assumptions questioned by opponents of the 'manpower-requirements' approach. They point out that forecasts become less reliable the further ahead they try to look. The problems of predicting technological change are much greater, and the implications of errors much more serious, if attempts are made to estimate the manpower structure in twenty years, rather than five. If they had been making forecasts twenty years ago, how many people would have correctly estimated the impact of computer technology on the distribution of jobs? As it turned out, this consideration would have been equally important, whether they were attempting a prediction or a conditional forecast, on the basis of a target level of output.

3.5 The choice of time-scale for manpower forecasts remains one of the most powerful sources of disagreement between advocates and critics of the approach. It is illustrated by the following statements:

> Even if accuracy will diminish with distance, manpower forecasts must cover a series of years reaching some time ahead . . . There is also a minimum time interval within which there is little point in making forecasts. This is the period for which the stock of qualified manpower is already broadly determined.[15]

> **We feel that manpower forecasting should become much more of an on-going activity and that short-term forecasts should be made fairly regularly at short-term intervals. This would afford greater flexibility and would also give more scope for improvement of the models used. In time we may even learn to predict accurately further into the future.[16]**

3.6 Parnes realizes that to forecast what he calls 'future demand in the market sense', it would be necessary to analyse occupational wage-rates, and anticipate shifts in relative wage levels. But he makes no recommendation that this should be done, since he is concerned with the number of people who will be employed at a given level of technology, on the implicit assumption that there will be no change in relative wages. This assumption, that relative wages can safely be ignored, is the one most often challenged by opponents of manpower forecasting, who have more faith than Parnes in the power of the market to eliminate shortages or surpluses. This is an essential difference between the 'manpower-requirements' and the 'human-capital' approaches to planning. According to Parnes, 'in no society is it believed that market forces can be relied upon to govern the allocation of resources' to education. There is a clue here to the whole debate on forecasting, which, as later sections of this paper show, is concerned with how far market forces can be relied upon to *influence*, even if not to *govern* resource allocation.

The relationship between the educational qualifications of workers and output

3.7 Perhaps the most crucial point discussed by Parnes is the assumption, common to all manpower forecasters, that there is a fixed relationship between the level of output in an industry, or a sector of the economy, and the input of qualified manpower. Parnes does mention the possibility that employers may 're-engineer jobs' to overcome extreme manpower shortages. In general however he believes that the relationship between the qualifications of workers and their level of output is stable, because it, in turn, is determined by two stable factors—the labour productivity (or output per man) of workers doing different jobs, and the educational qualifications necessary for that job. In other words, the idea of a fixed relationship between education and output rests upon what Parnes calls the 'rather rigorous link that has been assumed between productivity levels and occupational structure on the one hand, and between occupation and educational qualifications'.[17]

3.8 You are shortly going to read Blaug's criticism of these assumptions, and consider the evidence he presents for and against their validity. Before turning to the set book you should spend a short time considering the implications of these assumptions, and then answer the self-assessment question below.

Self-assessment Question 2

(i) Which do you think are more valuable for the policy-maker: long-term estimates that give a rough indication of future manpower needs, or short-term forecasts that he can be fairly sure will be accurate? Do not spend too long on this question, as you will gain more ideas on the subject in the set readings.

(ii) Give *one* example of a way in which an increase in the earnings of graduate chemists in relation to those of other workers may lead to an increased supply, and *one* example of how employers may reduce their demand. How long do you think it would be before you might expect to see these effects?

(iii) Give *one* example of an occupation in which you would expect most individuals to have the same level of education. Do you think this pattern would apply to the majority of occupations in Britain? When you have answered this question, check your answer with paragraph 3.9 below.

The relationship between the educational qualifications of workers and their jobs

3.9 Apart from occupations such as pilot, doctor, or dentist, where a particular type and level of education is a precondition of a licence to operate, there are few occupations for highly qualified manpower that do not exhibit considerable variability in the educational qualifications of workers. Even an occupation such as 'university professor' may be filled by a graduate with a PhD, an MA, or a BA. How much more variation would be likely in an occupation such as 'manager'? Consider Table 12, quoted by Parnes, which shows the extent of international variation around 1951 in the length of education of workers in particular occupations. Although the data are twenty years old, there is no evidence that the variability of educational qualifications has lessened very sharply.

TABLE 12 Percentage distribution of selected specific occupational categories by years of school: Canada, England and Wales, France, and the United States

Occupation	Total	Years of schooling		
		0 to 8	9 to 12	13 or more
1 *Engineers*				
Canada	100	1	7	92
England & Wales	100	21	32	47
France	100	7	21	72
United States	100	6	22	72
2 *Physicians and surgeons*				
Canada	100	0	*	100
England & Wales	100	1	2	97
United States	100	1	2	97
3 *Pharmacists*				
England & Wales	100	8	28	64
United States	100	4	18	78
4 *Teachers* (total)				
Canada	100	1	38	61
England & Wales	100	7	11	82
United States	100	2	6	92
5 *Lawyers and judges*				
Canada	100	< 0.5	5	95
England & Wales	100	7	18	75
United States	100	2	4	94
6 *Accountants and auditors*				
Canada	100	1	55	44
England & Wales	100	12	45	43
United States	100	5	37	58
7 *Artists, writers, journalists, and the like*				
Canada	100	13	49	38
England & Wales	100	34	34	32
France	100	39	47	14
United States	100	9	36	55
8 *Nurses*				
Canada	100	1	54	45
England & Wales	100	39	38	23
United States	100	4	43	53
9 *Photographers*				
Canada	100	22	60	18
England & Wales	100	51	37	12
United States	100	14	59	27
10 *Watchmakers, jewellers and related precision workers*				
Canada	100	39	54	7
England & Wales	100	67	28	5
United States	100	28	60	12
11 *Barbers, hairdressers and manicurists*				
Canada	100	51	46	3
England & Wales	100	70	27	3
United States	100	38	55	7

SOURCE: Parnes, H. S. (1962) *Forecasting educational needs for economic and social development*, Paris, OECD, Table 3.

Reading 9 **You should now read the first part of Chapter 5 in the set book by Blaug (pp. 137–145), and then my comments on it. This examines some of the assumptions we have already discussed, particularly:**

(i) the need for long-term forecasts;

(ii) the fixed relationship between the educational qualifications of a worker and his level of output;

(iii) the rigid relationship between a worker's education and his subsequent occupation;

(iv) the belief that changes in relative earnings, and their effect on the demand and supply of qualified manpower, are not powerful enough to provide a cure for manpower shortages or surpluses.

The significance of time-lags

3.10 In discussing this last point, Blaug refers to the concept of 'cobweb-cycles' (p. 139). This is a device used by economists to describe the conditions in a market where time-lags are important: when they are analysing the demand and supply of a commodity such as wheat, or tea, where there is a year or more between the time when a producer plants his crop, and the time of harvest. The gap means that although demand at any one time is determined by the current price of the commodity, the supply is determined by the price prevailing when the crop was planted. If a shortage pushes up the price, suppliers may over-react and plant too much. In the following year the price will fall sharply, because there is now an excess supply.

3.11 This point may well be obvious to you. Whenever there is concern about an impending shortage, for example of potatoes, a predicted (or actual) increase in price is likely to induce farmers to plant more of the crop, and to attract new producers, for instance amateur gardeners growing their own. A threatened shortage may thus become a glut, with consequent fluctuations in price. So much you will know from everyday experience.

3.12 However, it will be helpful to analyse this situation more rigorously, with the aid of the demand and supply curves introduced in Figures 9 to 12. The analysis will explain the use of the term 'cobweb cycles', which you will find in the set book, and in the article by Freeman set as a reading for Adam Westoby's paper (Block I, Paper 4). You should then consider whether the market for educated manpower is likely to correspond with this stylized picture.

3.13 We start by considering the point at which the demand and supply curves cross: that is, the price that equates the demand and supply for a product—let us call it Christmas trees—with a one-year production cycle; in other words, at least a year between planting and marketing. A graph can be drawn to show the demand for Christmas trees (D). This demonstrates the relationship between the number of trees that consumers will *buy* at a given price. A supply curve (S) shows the number of trees suppliers will *plant*, at a given price, to sell the following Christmas. The 'equilibrium price' for trees is shown by the point (A) at which the curves cross; at this price (Oa) suppliers will plant just enough trees (Ob) to be able to satisfy demand the following year. This graph, shown in Figure 13, is exactly the same as the more general one shown in Figure 12 above.

3.14 Suppose that for some reason the equilibrium is disturbed. Look at Figure 14. One Christmas, shops selling Christmas trees increase the price to Op. The shopkeepers are, however, ignorant of the shape of the demand and supply curves, and do not know how consumers and farmers will react to the change in price. At this higher price, farmers are willing to plant more trees, and so, by the next Christmas, a larger quantity of trees is available for sale, O*q*. However, the shops now find that they cannot sell such a large quantity of trees at the price O*p*, but have to drop the price to O*m* (the price on the demand curve corresponding to the quantity O*q*). This drastic fall in price causes farmers to reduce their planting for the following year to O*n* (which you can read off the supply curve by looking at the quantity corresponding to O*m*).

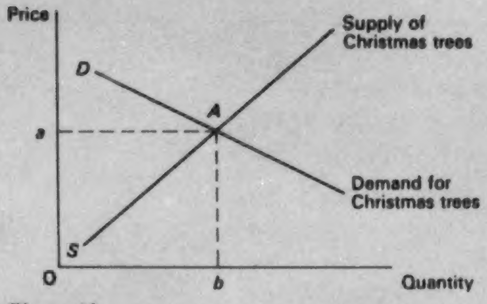

Figure 13

3.15 You can now see, in the model shown in Figure 14, that by a series of price fluctuations, each one of which causes consumers or producers to 'over-react', the market will gradually revert to an equilibrium price (O*a*). The term 'cobweb' refers to the shape of the graph. (If the slope of the demand and supply curves were different, the graph would look different, and in some circumstances, the fluctuations in price would lead away from equilibrium rather than towards it.)

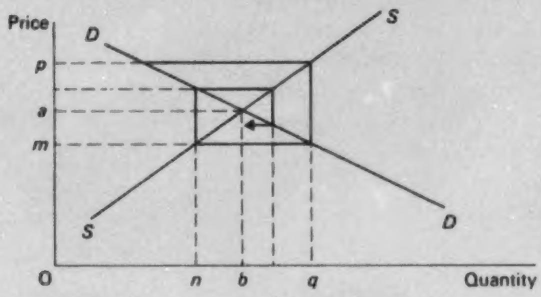

Figure 14

According to this simplified model, it will be a number of years before demand and supply are in balance again, and during these years there will be either a shortage or a surplus of Christmas trees. Clearly, this is inefficient, and it seems obvious that it would pay the farmers to take some steps to hasten the process.

3.16 What they should do depends on the characteristics of the market, and in particular on how responsive the demand for trees is in relation to changes in price, and also on whether there are any substitute commodities. If there are no substitutes, farmers may be able to forecast the demand for trees in the following year before planting, and so enable a shortage (or surplus) of trees to be overcome in no more than a year. However, if demand is very variable, it might be better for farmers to try to develop substitutes (holly or plastic trees) rather than to try to forecast next year's demand.

3.17 In other words, while it may be obvious to everyone, consumers and producers alike, that it is inefficient to sit back and wait for market forces to restore the balance between demand and supply, it is not obvious, without some market research, that forecasting is necessarily the best way to intervene.

3.18 This, essentially, is what the argument between supporters of manpower forecasting and supporters of a 'market' approach to educational planning is about. For some reason, equilibrium does not exist between demand for educated manpower and supply, at a particular wage or salary level. The question that faces the government, as chief supplier of manpower, through its control of higher education, is whether it is more efficient to try to restore equilibrium by forecasting, or by other means.

3.19 To say that the market for highly qualified manpower is subject to 'cobweb cycles' is, therefore, to make a statement about the characteristics of the market. It means that the time-lag between a decision to expand the supply of manpower and the time when the new graduates are ready for employment is so long that changes in 'price', or in earnings, may cause graduates or employers to over-react, so that shortages will turn into surpluses, and earnings will fluctuate wildly, without necessarily leading to equilibrium, or at any rate without doing so quickly.

3.20 The evidence that Blaug cites, from Arrow and Capron,[18] shows that in the USA in the 1950s, a sharp rise in demand for scientists and engineers, combined with the relative rigidity of supply, led in the short run to a 'shortage', which caused a rise in relative salaries. But time-lags and rigidities in the market were so significant that employers did not reduce demand sufficiently to eliminate the shortage. However, Arrow and Capron do not believe, and neither does Blaug, that this evidence invalidates belief in the power of market forces. Manpower forecasters, on the other hand, argue that time-lags are so important that the market is powerless to eliminate shortages unless assisted by manpower planning and forecasts.

3.21 The point at issue is not whether there are time-lags, or whether these are significant. Clearly time-lags occur in the labour market, and students, employers and planners all base decisions on out-of-date information. Nor is there any disagreement about the need to eliminate shortages or surpluses of manpower as quickly as possible, in order to make the most efficient use of scarce resources. The basic disagreement is about whether *forecasting* is an appropriate tool. In the simplified example above, we saw that in some circumstances farmers could forecast demand fairly accurately, but that if there was no general rule about the number of trees a family would buy, it might be better for farmers to try to make supply more responsive to market conditions, for instance by leaving some trees in the ground for two years, or by growing a substitute product.

3.22 Similarly, if there is no rigid relationship between education and occupation, and if substitutes are available for highly qualified manpower (less qualified workers given special on-the-job training, for example), the significance of time-lags in the labour market is lessened, as is the need for manpower forecasting. On the other hand there is still a case for manpower *planning*, even if there is less need for manpower *forecasting*. This is an important distinction, which we will look at again in section 6. For the moment you should note that this issue depends very much on the characteristics of the labour market, and in particular on whether employers can substitute one kind of manpower, or one kind of education, for another. These questions are dealt with later.

The interdependence of supply and demand

3.23 Parnes recognizes that 'the number of workers employed at a given moment of time is a measure both of the supply and the demand'.[19] However, by suggesting that the observed occupational and educational structure of the labour market can be used as a basis for forecasting, he implies that they reflect demand alone; in other words, he suggests that supply and demand are independent of one another, and that the effect of supply can safely be ignored. Blaug scorns this assumption, and another, sometimes made by forecasters, that in the market for qualified manpower, 'supply creates its own demand'.

3.24 Blaug refers to this as a modern version of Say's Law. This 'law of markets', propounded by a nineteenth-century economist, is concerned with the fact that an increase in production will necessarily mean an increase in payments to the factors of production (workers, capital and land). Say emphasized that, in the long run, there can be no such thing as overproduction, since the level of demand is determined by purchasing power in the economy, which is itself determined by the level of production (or supply). Say's Law refers to markets as a whole; he did not deny that individual firms or industries could produce more than they could sell.

3.25 In his criticism of this 'modern version of Say's Law', Blaug is drawing attention not only to the vague use of terms such as 'demand' and 'need', which we have already noted, but also to the logical inconsistency of asserting (or at least implying) that:

(i) supply and demand are interdependent and employers will react to an increase in supply by increasing their demand for qualified manpower;

(ii) supply and demand are independent, and the existing manpower structure can be regarded as a true reflection of demand.

3.26 Blaug's own position on this issue is clearly summarized earlier in the set book:

> We may conclude, therefore, that the occupational or educational composition of the labour force in a country is always to some extent the outcome of both demand and supply forces. As a matter of fact, the tendency to up-grade the minimal hiring standards for particular jobs when the supply of labour becomes more favourable is one of the best-attested phenomena of the labour market and affords a typical instance of the interaction of supply and demand in creating a given skill mix.[20]

The substitutability of qualified manpower

3.27 We have already noted that the idea of fixed input coefficients is central to manpower forecasts; this means that a constant relationship between the input of qualified manpower and the level of output, either of an industry, or of the entire economy, is postulated. If this were true, employers could never substitute one type of labour for another, or substitute machines for labour. In the 'pilot analogy', which Blaug believes typifies manpower forecasting, there is no scope for substituting either capital or labour: without a pilot, the aircraft cannot be flown.

3.28 This analogy is frequently applied to scientific and technical manpower: a modern technically sophisticated economy 'requires' scientists or engineers just as the aircraft requires a pilot. This reasoning underlies the first long-term forecast for scientists and engineers made by the Committee on Scientific Manpower in 1956. The assumption of the forecast was that the number of scientists and engineers employed in industry would increase at the same rate as the target growth of output (4 per cent a year). In fact output rose by 2.1 per cent and employment of scientists and engineers by 8.5 per cent.[21] This is just one example of evidence that has now been collected in several countries which shows that the idea of a constant relationship between input of highly qualified manpower and output is not well founded.

3.29 The evidence suggests that the substitutability of different kinds of manpower is much greater than is assumed in manpower forecasting. In an earlier part of the set book, when he considers the results of an international comparison by the OECD of levels of output and educational and occupational structure in fifty-three countries, Blaug summarizes the evidence on this question as follows:

> The question of substitution possibilities is so important that we would do well to reiterate the argument: almost infinite are the variations on the theme of substitution between factors in an economy. Even when different types of labour and capital have to be combined in absolutely rigid proportions at any level of output, the proportions themselves may well be different at different levels of output—the case of non-constant returns to scale. But even if returns to scale are constant in every industry, the so-called 'input coefficients' might differ in different industries; variations over time in the industrial distribution of total output, because of variations in the pattern of demand, will therefore produce substitution between factors across industries. Even if the industrial distribution of total output does not vary over time, however, the list of goods imported and exported might vary; we can still get factor substitution from this source of variation and for many economies this proves to be a significant source of changes in factor proportions for the economy as a whole. Putting it all together, it is not obvious that there is always much scope for substituting different factors for each other in each and every economy; it *is* obvious, however, that there is some scope for substitution in any economy.[22]

3.30 The advocates of manpower forecasting do not deny that these possibilities for substitution exist, but they question how significant they are for policy-making. Ultimately, the important questions are how quickly the labour market can respond to changes in price or supply, and how quickly employers can put the opportunities for substitution into effect. This reopens the question of whether forecasts should be short-term or long-term. If, in the long run, employers have the choice of a range of technical processes, each using a different combination of capital and labour, or of skills, there seems to be less need for long-term projections of 'requirements' which are technically determined, and a correspondingly greater need to take account of differences in the relative price of input factors. Obviously, however, the possibilities for substitution can be exaggerated. An important factor to consider is how easy it is for employers to substitute one type of qualified manpower for another.

3.31 This brings us back to the problem of the link between a worker's job and his educational qualifications. Before considering this further, you should try to answer the following question.

Activity

Why do you think that Blaug says: 'The daring leap in this argument is not so much the denial of any scope for substitution between people with different skills and capital equipment, but rather the definite link that is postulated between an industrial task and an educational qualification'? In this paper we have already looked at one piece of evidence that could be used to support or deny this 'daring leap'. What is this piece of evidence? What other types of evidence do you think would be relevant? You will find some answers to this question in the next few paragraphs.

The link between education and occupation

3.32 Whatever the methods and assumptions of manpower forecasts, they can be of no use for educational planning unless forecasts of the occupational structure can be translated into levels and types of education. This implies that a particular type of education is necessary, or at least appropriate, for every occupation. However, Parnes himself points out that there is no unique and rigid relationship between education and occupation, and gives a table showing the wide variations in length of schooling among people in the same occupational category in different countries (his table 1). Nevertheless he assumes, for planning purposes, a close association between formal education and the skills used in a particular occupation. While he admits the importance of on-the-job learning, he does not attempt to analyse the complementarities between education and training.

3.33 Considerable evidence exists, however, that the relationship between occupation and education is much less rigid than most forecasts assume. The link can be analysed by comparing the skills involved in different occupations, according to detailed job analysis, with the actual qualifications of employees in the occupation. Blaug discusses two interesting attempts to do this in the USA, where the results of job analysis are available in the Department of Labor publication, *Estimates of worker trait requirements for 4,000 jobs*. Two attempts to translate these skills into years of formal education, and to compare them with the actual educational attainment of workers, revealed a fairly loose relationship between schooling and job skills.[23]

Reading 10 The implications of this type of evidence are discussed by Blaug. You should now read this section of the set book (pp. 153-9). You should go very quickly through pp. 153-5, which deal with the problem of classifying occupations, and pay more attention to the discussion on pp. 156-9 of the relationship between occupation and education. This concludes our discussion of the assumptions of estimates of manpower requirements. We are now going to look at manpower forecasting in practice.

Self-assessment Question 3

Table 13 comes from a study of the British electrical engineering industry, which examined the actual educational attainment of workers in a number of jobs for which job specifications were available, compared with the 'minimum level of education essential to proper performance of the job', according to the job analysis.[24] Look at this table and then answer the following questions:

TABLE 13 Requirements – attainments matrix 1: educational qualifications (all employees)

	Requirements											
Attainments	Sec. ed.	RSA	O	C & G	A	Prof I	ONC	HNC	Prof II	Degree	Total	*No requirements specified*
Sec. Ed.	15	17	48	3	8	7	35	30	1	2	166	*357*
RSA	2	7	1	1	3	1	1	2	0	1	19	*25*
O	2	1	18	0	3	2	2	0	1	1	30	*6*
C & G	0	0	1	1	0	0	7	13	0	0	22	10
A	0	0	3	0	0	1	3	1	0	0	8	*3*
Prof I	0	0	0	0	0	2	0	0	1	2	5	*4*
ONC	0	0	4	0	0	0	9	3	0	0	16	*9*
HNC	0	0	0	2	0	0	7	7	0	0	16	*1*
Prof II	0	0	0	0	1	0	0	0	0	0	1	*2*
Degree	0	0	0	0	2	0	3	3	0	1	9	*6*
Total	19	25	75	7	17	13	67	59	3	7	292	*423*

Summary:

	No.	*%*
Requirements > attainments	201	68·8
Requirements < attainments	31	10·6
Requirements = attainments	60	20·6
	292	100·0

(i) What proportion of the workers could be regarded as:

(a) 'under-educated';

(b) 'over-educated' for their jobs?

(ii) Assuming that the job specifications are reliable, what does this information suggest about:

(a) the efficiency of the firm in question;

(b) the availability of on-the-job training in the firm?

(iii) If similar evidence were available for a large number of firms, what implications would this have for manpower forecasting?

3.34 The authors of the study suggest their own answers to Question 3(i):

> (*a*) If requirements equal attainments for every job specified, as might be assumed in the crude approach to manpower planning, all observations will lie along the diagonal of the matrix.
>
> (*b*) Observations falling above the diagonal indicate that people are 'under-educated' in the sense of being employed in jobs requiring higher educational qualifications than they in fact possess, or else in jobs requiring qualifications of a similar educational level but of a different type (e.g. O.N.C. rather than G.C.E. 'A' level).
>
> (*c*) Similarly, observations falling below the diagonal indicate that people are 'over educated' in the sense of being employed in jobs requiring lower educational qualifications than they at present hold, or else in jobs requiring qualifications of a similar educational level but of a different type.

and Question 3(ii):

> (*b*) Observations falling below the diagonal indicate personnel with educational levels that would qualify them for a group of jobs with a 'higher' educational requirement than that of the actual job in which they are employed. The implication is that of wasteful employment of qualified and hence expensive personnel; one explanation for this may be what we earlier called 'conspicuous consumption' of educated manpower, which, in a large interfirm study, should be reflected in comparative value-added figures and other indices of economic performance. For the individuals concerned, the implication is that they are unable or unwilling to take a job for which their educational attainment would fit them. These results could, however, be the reflection of an excess supply of qualified personnel in the economy: the lower the salary differential of higher over lower qualified personnel, the more rational the action of firms employing 'over-educated' personnel, and the more rational the action of individuals in accepting work of a level below that for which they are qualified.
>
> (*c*) Observations falling above the diagonal would indicate that jobs are being filled by men whose educational attainments do not match up to the requirements specified by the firm. In the absence of data on their performance, it must be assumed that these individuals have acquired equivalent education through on-the-job experience. A readily available indication of job performance is provided by the annual staff appraisal that is common in most companies (including Firm 3) and which is carried out by departmental managers and supervisors as part of the annual salary review procedure. If it were the case that individuals filling jobs for which they were not formally qualified did perform less well than others with adequate qualifications, then this would be indicated by a concentration of those individuals with low performance ratings in boxes above the diagonal in Matrix II.[25]

My own answer to Question 3(iii) is that if similar evidence were available on a large scale, forecasts of occupational requirements could not be converted into estimates of educational requirements.

4 Methods of manpower forecasting

4.1 There is no single method for estimating manpower demand or requirements, and the choice of method depends on the answers to a number of questions, including:

(i) Is the forecast a general forecast, concerned with broad occupational or educational categories (e.g. 'professional and technical manpower' and 'graduates') or with a detailed occupational breakdown (e.g. 'mechanical engineer') and specific educational qualifications (BA, MA, HND, etc.)?

(ii) Does it cover the whole range of qualified manpower, or specific occupations such as doctors or teachers?

(iii) What data are available on the current manpower stock, the level of output, the occupational classification and the educational qualifications of workers in different industries?

(iv) Does the forecast attempt to predict the future, or to analyse the implications of particular targets?

4.2 In this section we shall examine the four main methods of forecasting that have been used in different countries:

(i) employers' estimates of future manpower requirements;

(ii) manpower–population ratios;

(iii) international comparisons;

(iv) extrapolation of fixed input–output coefficients, as exemplified by the MRP.

4.3 In Britain no one method has been exclusively applied, and later sections of this paper will look at examples of the first two methods of forecasting. The MRP method has never been applied in detail in this country, but is worth examining carefully, since it is among the most comprehensive and carefully worked-out examples of forecasting, and has been the subject of extensive evaluation. A number of useful lessons can be learned from it. Similarly, although few attempts have been made in Britain to forecast manpower needs on the basis of international comparisons, this approach is still sometimes suggested. Lord Crowther-Hunt for example recommended that 'we need to estimate our likely future needs for different broad categories of trained manpower, drawing from the experience of some of our industrial competitors and from their views on the different proportions and types of trained manpower they now have and are planning for'.[26]

Reading 11 You should now read Blaug's summary of the main methods of manpower forecasting in the set book, pp. 146–53, and then my comments in paragraphs 4.4–4.17 below. Note that whereas Blaug describes five methods of forecasting the following section has only four. This is because Blaug distinguishes between two types of forecasts based on fixed input–output coefficients: forecasts based on the *incremental* labour–output ratio (which he calls the ILOR-trend method) and forecasts of the MRP type, based on the *average* labour–output coefficient (which he calls ALOR). However, for simplicity, I have combined these two methods, since most of the same objections apply, whether an average or an incremental ratio is used as the basis for forecasting.

Surveys of employers' opinions

4.4 We have already seen, in the preceding section, that the answers that employers give, when asked to state the educational requirements of jobs, do not correspond closely to the actual qualifications of their employees. Not surprisingly, therefore, the forecasts made by employers of their demand for qualified workers have proved of little use for predicting demand in the economy as a whole. Employers are given no guidance about salary levels or their likely share of the total market, and therefore different employers may make different, and conflicting assumptions.

4.5 Some of the problems of using employers' forecasts as a guide to national policy were pointed out in 1964 in a discussion of scientific manpower forecasting by Peacock.[27] He gives an example of the problem of securing internal consistency of forecasts based on employers' estimates: one can easily imagine a forecast of output and employment in steel manufacture that does not correspond with the total input of steel assumed by the manufacturers of cars, domestic appliances and other steel users. Yet no one employer could be expected to take account of the estimates of other employers without very detailed guidance. One of the merits often quoted for the MRP approach to forecasting is that it overcomes this problem of internal consistency.

4.6 All this does not mean that individual firms should not attempt to project their own demand for manpower and use such projections in their own planning. Clearly, many firms do this already, with varying degrees of success. But it does not follow that forecasts produced by employers for their own purposes can simply be aggregated to produce forecasts for the whole economy, or even for a whole industry. Manpower forecasting by individual firms is often more readily accepted as *conditional* (that is, to use Gordon and Williams's terminology, a projection, rather than a forecast), than are national forecasts, which may be interpreted by policy-makers as predictions, rather than as analyses of the implications of specific assumptions about demand, price and technical progress.

4.7 We are not going to examine, in this paper, the problems and uses of manpower forecasting at the level of the individual firm, since we are concerned with the uses of manpower forecasting as a guide to national policy in Britain. It is perhaps worth noting that even individual employers face many of the problems we are discussing—what assumptions to make about the relationship between qualified manpower and output, or between education and occupation. A recent study of a sample of firms employing engineers noted:

> A general survey of the firms' policies indicates that a certain amount of lip service is paid to the concept of manpower planning. Recruitment targets are generally based on estimated output in the near future and involve the translation of this output into the appropriate number of engineers by some rule of thumb. Taking account of the existing stock and wastage rates yields an engineering recruitment figure for the current period. The apparent lack of importance of factor prices in the calculation seems at first sight, to fit in with the manpower requirements assumption of fixed proportions, but in fact the picture is more complicated. Manpower models, in so far as they exist, tend to be informal, *ad hoc* and subject to constant adjustment. One firm had recently introduced a system of forecasting based on a linear regression model in which the ratio of engineers to other employees in each district is held constant. Even in this case, however, it was claimed that the model's predictions were used as a rough guide and actual decisions were still flexible. Some firms indicated that an upper limit to the recruitment of engineers was set by manpower budgets, but did not at the same time imply that output was correspondingly constrained. There was an impression rather that crude targets for engineers could be modified within limits without causing a dramatic impact on production.[28]

4.8 This rather sceptical conclusion about employers' forecasts is supported by the evidence you looked at earlier in answering Question 3, which showed that in many cases the actual policy of firms did not correspond at all precisely with their stated requirements. However, the question of the accuracy of manpower planning at the level of the individual firm raises many questions which we cannot examine here, although later sections of the paper will touch upon some of them. For the present, you should simply note the conclusion of the Chairman of the Scientific Manpower Committee (the forecasts of which are examined in section 8 below) who told the Robbins Committee: 'one of the least reliable ways for finding out what industry wants is to go and ask industry'.[29]

Manpower–population ratios

4.9 Blaug's discussion of this type of forecast is confined to what he calls the 'density ratios' method, which is based on the ratio between a particular type of manpower (often scientists or engineers) and the labour force, or between one type of manpower and another (for example, engineers and technicians). It is perhaps worth commenting that assuming that two categories of manpower will move in step does not make forecasting any easier, but it does preclude any consideration of a change in the salaries of one group in relation to the other, or the question of substitutability between the two groups.

4.10 A more general description of this type of forecast is that it concentrates on the ratio between one type of manpower and a particular population parameter. The parameter may be the total labour force, or it may be the entire population, or the school population. This means that forecasts of demand for doctors based on doctor–patient ratios, or of teacher demand based on pupil–teacher ratios, can be regarded as variants of this method.

4.11 In Britain most forecasts of the demand for doctors and teachers have been based on this method. Its main problems are first the difficulties of population projections discussed by Gordon and Williams (Block I, Paper 2) and second the problem of allowing for changes in the ratio. Television programme 3 looks at the problems of forecasting demand for doctors. The special problems of forecasting demand and supply of teachers will be discussed in more detail below, in paragraphs 9.1 to 9.14. For the moment you should simply note that doctor–population ratios or pupil–teacher ratios represent 'staffing norms', but do *not* adequately reflect 'standards-of-service', to use Blaug's phrase. For example, a crude doctor–population ratio does not take account of the different, and possibly changing, demands of different groups in the population, or of changes of staffing brought about by new methods of organization in hospitals or group practice, or of changes in the ratio between doctors and nurses. As we shall see below, the teacher–pupil ratio does not adequately measure changes in the proportion of over-size classes, or in the regional distribution of teachers. Therefore, although at first sight measuring 'standards-of-service' may look easier than measuring labour productivity in manufacturing industry, in practice this method also raises problems.

International comparisons

4.12 The discussion on international comparisons in the set book is very brief at this point because Blaug has earlier examined evidence for and against the idea that different countries follow the same 'world manpower growth paths', that is, share a common occupational and educational distribution of the labour force, at the same level of output.[30] If this were true, it would mean that richer countries could show poorer ones what to expect in the future. However, all international comparisons of the educational and occupational structure of the labour force, in relation to levels of output or output per worker in different countries, have revealed very little correlation between occupational distribution and output. For example, Layard and Saigal calculated regression coefficients in different economic sectors, and for a number of occupational and educational categories in thirty countries, but found no satisfactory pattern of relationships. More recently an OECD study of fifty-three countries found no clear relationship between the educational structure of the labour force and the level of economic development, and concluded:

> the analyses carried out in this study—both with regard to occupational and educational percentages and to occupational and educational coefficients—strongly suggest that possibilities of partial substitution between different types of labour exist at given levels of economic and technological development.[31]

4.13 In other words, there is no support here for the idea that a country can forecast its own manpower requirements by looking at the pattern prevailing in another country with different supply conditions, different relative prices of input factors, and different sectoral distribution of output. However the idea that Britain should attempt to forecast manpower patterns by looking at foreign experience remains strong. For example, Lord Crowther-Hunt, speaking in the House of Lords in March 1976, spoke of a study being undertaken by the Department of Education and Science,

> which shows what is happening in other countries, the proportions of different sorts of manpower that they are producing alongside the proportions we are producing. Then we can ask ourselves some fundamental questions as to whether they have got it right or whether we have got it right.[32]

4.14 This merely serves to emphasize a common problem in economics. What use can be made of international comparisons in situations where several different countries share common problems simultaneously, despite substantial differences in domestic conditions, factor prices, and relative demand and supply? This problem has not not yet been solved. For the moment, however, while it may be very useful to ask the sort of 'fundamental questions' just suggested, there is no evidence that international comparisons provide a good basis for forecasting one country's demand for manpower.

The Mediterranean Regional Project

4.15 You have already read, in the extract by Parnes, some discussion of the objectives of the Mediterranean Regional Project. We turn now to an examination of the methods used. You should bear in mind that the MRP was concerned with economies considerably less developed than the British economy. Therefore, it is quite likely that the satisfaction of economic growth targets may have a higher priority in these countries than you might feel it ought to have in Britain. The various steps involved in the preparation of manpower and educational forecasts for the six countries of the MRP can be summarized fairly briefly. Blaug summarizes them in four stages, and O'Donoghue, in Chapter 6 of his book, in five.[33] Parnes himself describes the process in eight essential steps, but does not include in his list the setting of output targets. This is because he regards this not as a part of forecasting, but as a prior step, since the purpose of the MRP forecasts was to spell out the manpower and educational implications of target levels of output. 'In general, no attempt has been made to "forecast" unconditionally the future rate of growth. What has been done is to establish, or to adopt already established targets for the growth of output per worker.'[34]

4.16 When these targets for output per worker have been established, broken down by sector and industry, the educational planning process involves eight stages:

(i) analysis of the current stock of manpower, classified by occupation and education;

(ii) forecasts of the total labour force in the target year, and its sectoral and industrial distribution, based upon the target figures for output per worker;

(iii) estimation of the occupational distribution of the labour force in each industry;

(iv) conversion of the required occupational structure into an estimate of the required educational structure, on the assumption of a fixed relationship between occupation and formal education;

(v) forecasts of additions to the stock of workers with each type of educational qualification, on the basis of data on the outflow from the education system, and retirements, deaths, migration, etc.;

(vi) calculations of the enrolment rates necessary to achieve the desired increase in the stock of manpower;

(vii) estimation of the necessary increase in teachers, buildings, equipment, etc., implied by the enrolment targets;

(viii) calculation of the current and capital cost of the educational targets.

4.17 This outline gives a clear indication of what needs to be done, rather than how it was done in the MRP countries. In fact, several different methods were adopted in making projections, including all those so far mentioned (employers' estimates, extrapolation of trends, international comparisons) as well as assuming that patterns of employment or productivity in 'leading firms' would be copied by other firms in industry. All the problems encountered so far are common to other forms of economic forecasting. What is unique to this type of forecasting is the problem of postulating a relationship between education and occupation.

4.18 We have already considered how realistic some of the assumptions of the MRP methodology are. In the next section we summarize the main criticisms that have been made of the approach on the basis of a technical evaluation of the project commissioned by the OECD, before turning to the general question of how to evaluate manpower forecasts. First it will be helpful to look very briefly at the data requirements of the MRP approach.

Activity

On the basis of what you have read so far, what data do you think the planner would need to make MRP-type forecasts of manpower requirements? You should try to think of at least *four* types of data that would be essential, and then read the following paragraphs, which provide two checklists.

Data requirements

4.19 Ahamad and Blaug, in their criticism of the MRP method of forecasting, make the point that:

> The MRP method is also fairly expensive to apply because of the data requirements. Manpower data are required cross-classified by occupation and industry and by education and occupation and preferably for a number of time periods. Normally, such data are available only in census years at decennial intervals and hence are often quite out of date. In addition, the education, occupation and industry classification systems used have changed so much from one census to the other that such data are not usually directly comparable over time. Data are also required for output and total employment by industry for a number of time periods. Input–output tables tend to provide more accurate projections of output and hence are preferable to simple estimates of real domestic product by industry. But input–output tables are expensive to compile and are usually available only for one time period, if at all.[35]

4.20 Parnes, in a summary of the data requirements, lists the following data as necessary simply for the inventory of the current manpower stock:

- (i) labour force participation rates, by 5-year age-groups and by sex;
- (ii) estimates of unemployment and under-employment;
- (iii) occupational distribution of employed workers, by industry, branch and sex;
- (iv) educational qualification of employed workers by occupation;
- (v) distribution of labour force, by level of education.

To this list could be added:

- (vi) trends in output per worker, classified by industry and occupation;
- (vii) rates of retirement, death and migration, by sex;
- (viii) estimates of teacher–pupil ratios for each type and level of education;
- (ix) current and capital expenditure per pupil, by type and level of education;
- (x) estimates of rates of wastage, by level of education.

4.21 This list is a formidable one for any country. When you remember that the MRP methodology was developed for use in fairly poor countries, you may well think that the method is too data-intensive to be of much use for the policy-maker. Interestingly, one reason given by the Robbins Comittee for rejecting the manpower-requirements approach was the lack of relevant data.

5 A critical evaluation of the Mediterranean Regional Project

5.1 The Mediterranean Regional Project has been described as 'the most significant effort to date of educational planning based on the manpower-requirements approach'.[36] It has, therefore, been subjected to more criticism and analysis than any other manpower-forecasting exercise. Probably the most useful is a technical evaluation by Hollister, which was commissioned by the OECD. He tried to isolate some of the criticisms that had been made of the manpower-forecasting approach, and to assess the strength of these criticisms in the light of the MRP data. He concentrated mainly on five questions that had been raised about the validity or usefulness of the manpower-requirements approach:

1. Is the quantitative impact of manpower requirements on the educational system likely to be very significant?
2. To what degree do uncertainties about productivity change (technological change) affect estimates of manpower requirements?
3. Are occupational input coefficients at a given point in time fixed or variable, and how much difference would it make if they were variable rather than fixed?
4. To what degree must the economic structure and the labour force be disaggregated in making estimates, i.e. must separate estimates be made for economic sectors, industries, or firms, and how far must the labour force be broken down by occupations if reliable estimates are to be made?
5. What difference does the general ignorance of occupational–educational relationships make in the determination of the usefulness of educational requirements estimates derived from projections of manpower needs?

5.2 Hollister does not claim to have provided definitive answers to these questions, but both his method of analysis and his conclusions are extremely interesting. He relied upon two basic methods of analysis:

(i) *Sensitivity analysis*, which involves taking a key variable or assumption, changing it slightly, and then reworking the estimates to see how sensitive the final result is to the change;

(ii) *Sources-of-change analysis*, which involves estimating how much of the total change in a figure is caused by each of the various factors that together determine it. For example, let us use the symbols adopted by Blaug in the set book (p. 151) and write the equation for the required number of workers in occupation K in industry j:

$$L_{kj} = \left(\frac{L_{kj}}{L_j}\right)\left(\frac{L_j}{X_j}\right)\left(\frac{X_j}{X}\right)X$$

This equation states that the number of workers is determined by four factors:

(i) the number in the occupation as a percentage of the labour force in each industry, L_{kj}/L_j;
(ii) the productivity of labour in each industry, expressed as a labour–output coefficient, L_j/X_j;
(iii) the industrial distribution of GNP, X_j/X;
(iv) the level of GNP, X.

5.3 The purpose of sources-of change analysis is to see how much of the total change in the number of workers can be attributed to the estimated changes in the four factors. This is important because, during the forecasting period, each factor may be expected to change. Some factors may, by themselves, cause an *increase* in the number of workers in the occupation; others may cause a *decrease*. The analysis can therefore show the relative importance of the factors in determining the outcome.

Reading 12 You should now read the extract by Hollister, which summarizes the conclusions of his evaluation of MRP. Before turning to the final paragraphs of this section, you should test your comprehension of this passage by answering the following questions.

Self-assessment Question 4

(i) What does Hollister regard as the least satisfactory step in the process of estimating manpower requirements?

(ii) Do the results of the analysis support the assumption of fixed input coefficients?

(iii) What implications does this have for the idea, discussed in paragraphs 3.27 to 3.30 above, that the wide range of alternatives open to employers offers scope for substituting one type of manpower for another?

(iv) Should forecasts consist of single-valued estimates of manpower requirements, or should they take explicit account of uncertainties about the future?

(v) Is it easy to predict the rate of technological progress? Does it matter?

5.4 Hollister emphasizes the value of the MRP exercise, although his analysis suggests some fundamental weaknesses in the assumptions and methods of forecasting. In particular:

(i) the concept of fixed input coefficients is shown to be misleading, and the analysis suggests that substitutability of manpower may be highly significant;

(ii) the idea that there is a rigid relationship between occupation and education is 'the weakest link' in the manpower-requirements approach;

(iii) technological change is difficult to predict, but is a very important variable, determining the occupational distribution of the labour force;

(iv) single-valued forecasts which make no attempt to measure the effect of alternative assumptions may be misleading for educational policy, which should be flexible to allow for uncertainties about the rate of technical progress and the link between formal education and the skills of workers.

5.5 In the last part of this extract, Hollister attempts to reconcile the various 'approaches' that have been recommended for educational planning. He does not regard them as inconsistent with one another, but urges that studies of the private demand for education (which he calls 'social demand') should be combined with an analysis of the manpower implications of economic growth and with a study of the way the labour market operates in allocating trained manpower. Although he does not use the terminology of education as an investment, he clearly has in mind such questions as the effect of relative earnings on the private demand for education, and the comparison of the social costs and benefits of different types of education. He regards the integration of the alternative approaches advocated for educational planning as a prerequisite of 'more enlightened and dynamic educational policy formation'.

5.6 This theme is taken up, in a rather different way, in the set book by Blaug, when he compares the assumptions of strict manpower forecasting with those of the rate-of-return approach. Blaug's summary of the differences between the two approaches is in terms of 'Two Views of the State of the World'. Hollister pleads for a reconciliation between the various approaches; Blaug emphasizes that 'the real world lies somewhere in between'. However, the contrast he draws between the extreme version of the two approaches is a useful way of summarizing the assumptions and implications of manpower forecasting. In drawing together the strands of the argument so far about the difference between manpower forecasting and rate-of-return analysis as a means of avoiding surpluses or shortages of skilled manpower, you will find it helpful to attempt the following exercise. Don't worry if you find the terminology or some of the concepts rather difficult. They will be explained more fully in the reading that follows the exercise. Nor should you worry that some of the statements are caricatures of real assumptions. They are not meant to describe the real world.

Activity

In the set book Blaug summarizes the 'Two Views of the State of the World' in a table that distinguishes between the assumptions of the manpower-forecasting view of the world and the rate-of-return view of the world. Before reading Blaug, look through the following list of assumptions and decide in which category you would put each one. You might like to do this in tabular form.

Assumptions about the education system

(i) Students acquire more education for consumption reasons.

(ii) Students acquire more education for investment reasons.

(iii) Students are well informed and attentive to career prospects.

(iv) Students choose major subjects in ignorance of, or with no regard to, career prospects.

(v) All education is specialized and specialization starts early.

(vi) All education is general and there is no specialization at any age.

(vii) All input coefficients in schools are variable: complete divisibility and non-specificity of teachers, plant and equipment (i.e., pupil–teacher ratios are not fixed; teachers and others can do many different things, and it is easy to employ part-time teachers, or to employ team-teaching techniques, or to switch teachers from one activity to another).

(viii) All input coefficients in schools are fixed; with complete indivisibility and specificity of teachers, plant and equipment (i.e., the reverse of the above situation).

Assumptions about the labour market

(ix) The demand curves for different skills shift smoothly (i.e., technical progress, which creates demand for new skills, proceeds smoothly, not in fits and starts).

(x) The demand curves for different skills shift discretely (i.e., by means of rapid and unpredictable changes in technical progress and sudden, unexpected demands for new skills).

(xi) There is a high degree of substitutability between skilled men (i.e., workers can do different jobs equally easily, and employers can always choose between different combinations of skilled workers, or workers and machines, so that shortages are not crucial).

(xii) There is a low degree of substitutability between skilled men (i.e., shortages are crucial, since most products can only be made with one combination of inputs, and employers cannot swap a machine for skilled workers, or use a different combination of skills).

(xiii) Industry provides plenty of on-the-job training.

(xiv) Industry provides very little training.

Reading 13 When you have completed your own table, turn to the set book by Blaug, read pp. 214–24, and check your table against his (p. 216). (You will need to read the text on p. 215 carefully, since the two tables will not be identical.)

6 Two views of the state of the world

6.1 The contrast that Blaug draws is between two extreme views of the world. He does not believe that they fairly represent the views of most writers. As we have seen, Parnes certainly does not hold the very simplified view described on p. 216 as 'the manpower-forecasting view'. Just as there is a continuum of conditions, with the real world falling somewhere between what Blaug calls the 'neo-classical' and the 'Leontief-type' extremes, so there is a continuum of viewpoints, and most writers could be categorized as falling in between.

6.2 Leontief is an American economist who has developed the use of input–output models to study interrelationships in the economy. These models involve simplifying assumptions such as fixed input coefficients. Experience with these models, like experience with manpower forecasting, suggests that in the short run the assumption that inputs are used in fixed proportions is a fairly reasonable simplification, but that in the long run the neglect of substitution possibilities is a serious weakness.

6.3 In this section, Blaug again emphasizes the distinction between manpower *forecasting* and manpower *planning*, and advocates what he calls an 'active manpower policy'. In many ways what Blaug is advocating here is similar to the advice of Hollister, although the two attach differing importance to forecasting.

6.4 In Blaug's ideal world, very little reliance would be placed on forecasting because 'inaccurate forecasts can aggravate instead of improve the situation'. Hollister, on the other hand, admits that estimates of future manpower requirements are a necessary part of educational planning, and he believes that such forecasts can be justified in terms of current usefulness. When you have finished working on this paper, you will be able to decide for yourself which point of view you find more persuasive.

Activity

On pp. 220–1 Blaug suggests some elements that could be included in an 'active manpower policy'. Try to think of additional steps that could be taken by the planner to alter existing educational patterns and hiring policies. In the remainder of this paper you will find several more suggestions for the policy-maker about possible steps to take when adopting an 'active interventionist attitude to all forms of producing educated manpower'.

7 How to evaluate manpower forecasts

7.1 One main problem in assessing manpower forecasts is deciding what criteria to adopt in evaluating them. The problem is common to other types of forecasting that provide conditional forecasts rather than predictions. If a forecast is intended to examine the implications of a particular set of targets, on given assumptions, it may be impossible to judge it in terms of accuracy. Since the forecast is conditional upon a given target, rather than being a prediction, this means that if the target rate of growth is not achieved, it is impossible to describe the forecast as 'wrong'. All we can say is that the actual values of the variable differ from the forecast values. This may be because the assumptions of the forecast were mistaken, or it may be because the target was not achieved. Blaug discusses this problem at greater length in the last part of Chapter 5 in the set book.

7.2 In this section he examines the technical evaluation of MRP by Hollister, parts of which you have just read, but comes to a rather more pessimistic conclusion than Hollister, when he says that it 'marks the death knell of the manpower requirements approach *as it has been traditionally understood*'. I have italicized the words I regard as most significant in that sentence. The point, I think, is that, as Blaug says on the previous page, 'one of the problems is that all manpower forecasts to date have provided single-valued predictions rather than a range of estimates based on various assumptions'.

7.3 Now the forecasters themselves are quick to point out that they have *not* provided predictions. They have provided conditional forecasts intended to test the feasibility of certain externally established economic targets. However, the forecasts have frequently been *understood* as being predictions. Perhaps this is because policy-makers misunderstood the forecasts or perhaps because they were presented with spurious claims for accuracy. In either case, it would be misleading if the forecasts were not intended as projections, to assess them as 'hits' or 'misses' as Blaug does in Table 6 of the set book (p. 160), rather than on the validity of their assumptions, and their sensitivity to changes in these assumptions, as Hollister does.

7.4 One problem Blaug does not mention is that some forecasts are intended to be proved wrong. As an example, let us imagine a forecast of demand for doctors that finds, by extrapolation of existing trends, that there will be a shortage or surplus of doctors in the future; if the forecasters recommend a change in the intake of medical schools, in order to avoid this shortage or surplus, it would be quite unfair to criticize their forecast as inaccurate if the shortage or surplus did not materialize. However, if the proposed action is taken and a shortage still develops, or a shortage turns into a surplus, the forecast could be criticized for leading to inappropriate policy decisions.

7.5 When considering any forecast, we need to ask what its purpose was, and whether its results were presented in a manner consistent with that purpose. A number of manpower forecasts have been criticized not because they were inaccurate, but because they presented estimates *as though* they were intended to be accurate, when they were, in fact, conditional upon certain events happening.

Reading 14 You should now read the final section of Chapter 5 of the set book by Blaug (pp. 159–68), noting particularly the distinction between the *accuracy* of a forecast and the *usefulness* of a forecast.

Activity

Ahamad and Blaug quote three alternative criteria for judging forecasts:

(i) Does it correctly predict the future? (This is one measure of its *accuracy*.)
(ii) Does it reduce the level of uncertainty about the outcome that prevailed before the forecast was made? (This is one measure of its *usefulness*.)
(iii) Does it help in formulating unambigous policy decisions, or does it include so much uncertainty that contradictory policy decisions are consistent with it? (This is another measure of its usefulness or its *effectiveness* as a policy guide.)

Which criterion do you think should be applied in evaluating manpower forecasting in Britain?

7.6 When you have decided how you would evaluate a forecast, you should read the following sections. These attempt an evaluation of the British experience of forecasting the demand for scientists and engineers, and for teachers. You may also want to know which criterion Ahamad and Blaug selected. The following extract shows how they decided to evaluate manpower forecasting. If you would like to explore this problem further, you should read the introduction and conclusions of their book. This is not compulsory reading.

> The question we must ask ourselves therefore in trying to evaluate manpower forecasts is not whether or not they have differed from the outcome, but whether they have been sufficiently accurate for the purposes at hand. An inaccurate forecast that leads to an erroneous policy decision may be much worse than ignorance of the future, especially if the latter would have led to postponement of the decision. It is pointless to argue in general that forecasting is a desirable activity because there can be no harm in trying to reduce the uncertainty of the future. The question is whether we have actually succeeded in doing so without deceiving ourselves that the future is more certain than it actually is. We will see that it is not an easy question to answer decisively.[37]

8 Forecasting the demand for scientists and engineers

8.1 In Britain attempts have not been made to forecast demand for all categories of qualified manpower, but forecasts of demand for scientists and engineers have a fairly long history. Except for a short period in the 1940s, no attempt has been made to use these forecasts to determine the scale of higher education. In the 1950s and early 1960s, however, the UGC advocated, largely on the basis of manpower considerations, that two-thirds of all new places in universities should be in science or technology. Blaug suggests, in the set book, that by basing the general rate of expansion of higher education on projections of private demand, while letting forecasts of demand for scientists and engineers determine the distribution of places between faculties, British policy-making has combined the worst of both worlds: 'it is precisely in projecting the demands for particular skills, rather than in projecting the demand for all graduates, that the manpower requirements approach is most vulnerable' (p. 186 of the set book).

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8.2 On the other hand, the usual justification for forecasting requirements of scientists and engineers is that there is less scope for substituting non-scientific manpower for scientists and engineers than for substituting one category of non-scientific manpower for another. A shortage of scientific manpower is therefore likely to cause a more serious bottleneck than a shortage of graduates in general. In other words, the assumption of fixed input coefficients is believed to operate in the scientific field, if in no other. In addition, it is argued that the link between education and occupation is closer for scientists or engineers than for non-scientific manpower.

8.3 There is very little evidence to support this view. We have already looked at some British evidence, from the electrical engineering industry, on the difficulty of defining the educational requirement of particular jobs. A Swedish study of the substitutability of various types of engineers found very few examples of a job for which one and only one type of engineer was suitable.[38] Until recently substitutability had received little attention in Britain. One piece of evidence is an analysis by the Scientific Manpower Committee of data from the 1961 Census, which showed that of 260,000 qualified scientists and technologists 50,000 (almost 20 per cent) were in occupations that the Committee thought 'not likely to be closely related' to their scientific education. Some doubt is thus cast on the concept of a 'rigorous link' between education and subsequent jobs, even for scientists and engineers.

8.4 More recently, however, a study of twelve British firms employing engineers attempted to estimate the extent of substitution between people with different levels of engineering education, and with different subjects of specialization. This was done in two ways, first by asking the firms what policy they would adopt in the case of a shortage of 'suitably qualified' candidates for particular jobs, and secondly by examining the actual qualifications of workers. The authors concluded:

> . . . the evidence suggests that the scope for substitution of people with different qualifications in jobs which have been defined by qualification is much greater than manpower forecasters would have us believe. Only two firms fitted neatly into the fixed proportions picture and in one of these the lack of substitutability could be described as a quasi-legal rather than technical constraint. In all other cases substitution of some form is recognized either in theory or practice (or both) and in several cases is substantial.[39]

The study also showed that 25 per cent of the people with engineering qualifications employed in these firms were working in non-engineering jobs. 'Non-engineering jobs' filled by qualified engineers cover a wide range of firms' activities. Some have a strong technological or quantitative bias, for which an engineering background is probably useful, but others are in areas such as general management, marketing, planning, personnel and administration.

8.5 The authors of this study, Mace and Taylor, go on to explore possible reasons for this failure of one of the central assumptions of manpower forecasting. They conclude that the reason is that the forecasts specify a rigorous link between occupation and *formal education*, thus neglecting other important means of acquiring skills, in particular experience and on-the-job training:

> These results indicate that possible explanations for the existence of a non-zero technical rate of substitution between graduates and non-graduates in engineering jobs are first, that experience is at least as important as education in the transmission of skills, and secondly, that training can be an effective substitute for formal education. Because training involves costs, firms will tend to favour graduates, who initially have a slight advantage in skills or knowledge already acquired. When graduates are not available, however, training and experience provide the necessary flexibility to allow the employment of engineers with lower qualifications.[40]

8.6 It is likely, on the basis of this evidence, that any forecasts of demand for scientists and engineers in Britain will encounter all the now familiar problems. Indeed they do. The early forecasts of the Scientific Manpower Committee—in 1956, 1959, 1961 and 1962—were based on a variety of methods, including assuming a constant ratio between manpower and output (which proved to be a bad assumption) and asking employers (which, as we have already seen, led the Chairman of the Committee to say that 'one of the least reliable ways for finding out what industry wants is to go and ask industry').[41]

8.7 The experience since 1964 of the Scientific Manpower Committee, and its successor, the Committee on Manpower Resources for Science and Technology, has been examined and severely criticized by Gannicott and Blaug as 'simply a series of contradictions' and in particular for confusing the meanings of 'demand', 'needs' and 'requirements'. The forecasts frequently speak of 'demand' and yet totally ignore questions of price (or relative earnings). Gannicott and Blaug argue that instead of proving the frequently asserted claim that there was a shortage of scientists and engineers, the forecasts represent the 'special pleading of a science and engineering lobby'. (More recently, a review of all the evidence on the labour market for engineers in the 1960s, including data on earnings, job vacancies and trends in the stock of engineers, concluded that 'we find no evidence for the persistent shortage of engineers in the 1960s which was predicted by the Committee on Manpower Resources for Science and Technology. Their forecasts, which have a doubtful theoretical basis, are now found to be misleading in practice.')[42]

8.8 You will shortly read the chapter by Gannicott and Blaug. You should bear in mind that it is as much a recommendation of rate-of-return analysis as a criticism of manpower forecasting. As a result, some of the authors' judgements are less than objective. For example, many economists would disagree that 'armed with this tool, the problems which Dainton, Swann and Jones failed to explain satisfactorily fall neatly into place'. It is one thing in discussing the demand for scientists to criticize the Jackson Committee for ignoring relative earnings; quite another to suggest that rates of return demonstrate the existence of a surplus of scientists and engineers.

8.9 Many economists would agree with Gannicott and Blaug in their criticisms of the techniques and assumptions of the forecasts and, possibly, with their agenda for further research, without sharing their confidence in the power of market forces to adjust the balance of supply and demand. While their chapter is a useful reminder of all the weaknesses in the assumptions of forecasts of 'needs' or 'requirements' of scientific manpower, it makes no corresponding attempt to parade the weaknesses in the assumptions of rates of return, or to look at alternative theories about the labour market.

8.10 You may find it helpful when reading this chapter to remind yourself of Blaug's 'Two Views of the State of the World', and consider whether you think that the market for scientific manpower lies closer to the right or to the left of the continuum discussed in section 6. For example, consider carefully the brief discussion in the reading of the work of the Swann Report (on the flow of scientists and engineers into employment), the Dainton Report (on the flow of science and technology candidates into higher education, popularly known as 'the swing from science') and the Jones Report (on the 'brain drain'). If the Committee on Manpower Resources was right in thinking that all these phenomena demonstrate the 'rigid and specialized nature' of the British educational system, Britain could be said to be nearer to the 'fixed input' end of the continuum. On the other hand if students' career choices are very much influenced by relative earnings, Britain's position would shift towards the 'neo-classical' end.

eading 15 You should now turn to the Gannicott and Blaug reading and then try to answer the following questions, before continuing with this section.

Activity

Suppose you were a member of the Committee on Manpower Resources for Science and Technology. How would you answer a critic who said that your advice on demand for scientists and engineers had been useless for policy purposes?

After reading Gannicott and Blaug, which course of action would you wish to recommend to your fellow committee members:

(i) prepare new forecasts of *demand*, using better techniques;

(ii) prepare new forecasts of *requirements* and, if necessary, try to persuade employers to alter their hiring practices, or the UGC its policy on student numbers;

(iii) collect and analyse information about the way scientists and engineers are used in the economy?

8.11 If we consider this experience of forecasting in the light of the criteria on accuracy and usefulness there seems no doubt that attempts to forecast requirements led to inaccurate predictions about a shortage of scientists and engineers, and to mistaken policy decisions about the balance between science and technology and arts faculties in universities. The article by Wilkinson and Mace, quoted above, which concluded that the Committee on Manpower Resources for Science and Technology was wrong in predicting a shortage of scientists and engineers, pointed out:

> The importance of our findings depends on the use which has been made of the forecasts. Did forecasts of impending shortages of engineers, for example, have any influence on allocations for engineering faculties or the decision to expand the facilities for engineering education in polytechnics? If so, our results suggest that the decision makers have been misled.
>
> If the identification of occupational shortages for purposes of manpower planning is to be taken seriously, a much more rigorous analysis of the subject is called for. Firstly, we need more information: annual figures are now published on earnings by occupation and age but data of the same type are also required for unemployment and vacancy rates, and much more detailed evidence must be supplied on the costs of education by individual disciplines. Secondly, more research is needed on the nature of professional labour markets to show how they actually operate. Until this is done, official forecasts of the 'requirements' for engineers must inevitably be of limited value.[43]

8.12 You should note however that some of the advice of the Manpower Resources Committee was very sound, particularly the advice of the Dainton Committee on reducing the specialization of science teaching in schools and increasing flexibility. But this advice was based not on forecasts, but on analysis of the way science was taught, and the way pupils made decisions about choice of career. In other words, the useful activities of the Committee were based upon analysis of the current situation, rather than on attempts to forecast on the basis of inadequate assumptions. This supports Gannicott's and Blaug's plea for a change in direction of research on manpower, and suggests that the third course of action given in the above activity would be more useful than the first two.

9 Forecasting the demand for teachers

9.1 Even if policy-makers abandoned all attempts to forecast demand for other types of manpower, some kind of forecast of demand and supply of teachers would continue to be needed, since the government and LEAs are together responsible for demand (through their statutory obligation to provide educational facilities) and supply (through control of the number of student places in higher education), and also price (through the administration of national salary scales for teachers). At first sight forecasting the demand for school-teachers would appear much simpler than forecasting other categories of manpower. Teacher forecasts do not depend on unknown factors such as the sectoral and industrial distribution of output, but on population projections and policy decisions about staffing norms or pupil–teacher ratios. Indeed, Moser and Layard, writing on the problems of manpower forecasting in 1964, asserted confidently: 'Apart from uncertainties about future birth rates, it is comparatively easy to forecast the number of school teachers needed to achieve certain targets for class sizes in the schools.'[44]

9.2 Unfortunately when we look at the record of teacher forecasting in Britain we encounter most of the problems that have been discussed in this paper. A review by Ahamad, in 1970, of all the forecasts prepared by the National Advisory Council on the Training and Supply of Teachers since 1956 showed them to be no more accurate, and no more useful for policy purposes than any other manpower forecasts.[45] At the time of writing (summer 1976) the protests about the unemployment of trained teachers provide a practical manifestation of the difficulties of predicting demand for teachers. The next few paragraphs will briefly summarize the main problems. You should then read the conclusion of Ahamad's paper.

Definition of terms

9.3 The Council took as its definition of demand the number of teachers required to satisfy a particular pupil–teacher ratio, rather than demand in the economic sense. They made separate projections of supply and defined a shortage as the gap between demand and supply. Since there is no mention of salary scales or of the level of public-authority expenditure, it would be quite possible, if the government wanted to cut public expenditure, to have a shortage of teachers as defined by the Council, combined with unemployment of qualified teachers, since local authorities were unwilling to employ more at current salary scales. This is what happened in 1976.

Choice of pupil–teacher ratio

9.4 The Council took as the main objective of policy the elimination of over-size classes (defined as 40 for junior pupils, 30 for seniors). They then chose an average pupil–teacher ratio which it was assumed would achieve this objective. The implicit assumption was that as the supply of teachers rose, the size of all classes (including over-size ones) would fall at the same rate as the average ones. This assumption did not take account of the problem of the distribution of teachers, and proved to be mistaken; in 1969 the DES admitted that in primary schools the proportion of over-size classes had fallen more sharply than would be predicted, on this assumption, but that in secondary schools the reverse was true. In a more recent publication the DES argues that:

> It is not known precisely what pupil–teacher ratio would be needed to achieve the Government's aim of ensuring that there should be enough teachers to permit the elimination of classes of over 30. Indeed, there is no exact relationship between pupil–teacher ratio and class size, as the latter is influenced by a number of factors other than the number of teachers available.[46]

The accuracy of population projections

9.5 Gordon and Williams have already examined the problems of predicting the size of the school population. The Council adopted the 'best estimate' projection of the Government Actuary, although the use of alternative projections would have increased or lowered the projected demand for teachers in 1976 by 10,000. This meant that errors in forecasting births, caused by mistaken assumptions about fertility and migration, were translated immediately into errors in forecasting demand for teachers.

9.6 In addition the proportion of pupils staying at school after the school-leaving age was underestimated. This meant that by 1968 underestimation of the size of the school population alone would have caused a 15 per cent error in the demand forecasts made in 1956.

Problems in forecasting supply

9.7 The task of projecting the supply of teachers can be broken down into separate projections of recruitment and wastage. The main difficulty lies in predicting wastage, and in practice wastage has proved to be consistently higher than the Council's assumptions.

The policy recommendations of the Council

9.8 The Council based its recommendations for policy on its own single-valued forecasts, making no allowance for alternative assumptions. Although it was aware of inaccuracies and possible sources of error, it chose to present the forecasts 'with a greater degree of precision than they can properly claim' since this allowed the balance between supply and demand to be more easily compared. On the strength of its forecast of an impending surplus of teachers, the Council recommended that teacher-training in colleges should be increased from two to three years in 1960. The change was introduced at the very time when it was becoming apparent that the Council had underestimated the number of pupils. The Council's recommendation therefore resulted in a greater shortage of teachers, according to its own definition of shortage, than would otherwise have occurred.

9.9 The other main policy recommendation of the Council was to increase the intake of students for teacher-training after 1966, because of its forecasts of a shortage. In practice the intake of the colleges of education exceeded these recommendations, so that the supply forecasts proved very inaccurate.

Assessing the accuracy of the forecasts

9.10 The effect of the Council's recommendations on supply illustrates one of the main problems of assessing the accuracy of teacher forecasts. Ahamad criticizes the Council's supply forecasts for inaccuracy on the grounds that 'the assumptions about recruitment and wastage turned out to be disastrously wrong, mainly because of the Council's later recommendations to expand the intake of the colleges of education'.[47] This completely ignores the fact that in this instance the forecast of a shortage was intended to be self-negating. It is difficult to test the accuracy of any forecast of a shortage if it is used as a basis for recommending a change in supply *in order to* eliminate that shortage.

The degree of detail of the forecasts

9.11 The later forecasts of the Council were based on more disaggregated data and a more complex forecasting model than those used earlier, but Ahamad believes they were no more accurate, although they tended 'to create the mistaken impression of high statistical reliability'.[48]

The sensitivity of the forecasts to changed assumptions

9.12 The Council did not attempt any sensitivity analysis, but in a few cases it is possible to see how sensitive the forecasts are to slight changes in the assumptions. For example, a small change in the average pupil-teacher ratio in 1960—from 27.0 to 26.5—would have increased the demand for teachers by 3,000. Allowance of a margin of error of ±5 per cent in the forecasts for 1968 would have implied a shortage of up to 30,000 instead of the predicted balance between demand and supply.

The DES has now abandoned single-valued forecasts of teacher demand and supply, and produces a range based on alternative assumptions about wastage, and on 'highest' and 'lowest' projections of school numbers, as well as a forecast based on the Government Actuary's 'official' projection.[49]

The effect of the forecasts on uncertainty

9.13 One criterion suggested for evaluating a forecast is whether it reduces the level of uncertainty. Ahamad compares the projection errors of one of the forecasts with the error that would have resulted if no forecast had been made at all, but it had been assumed that population, and therefore demand for teachers would remain constant. For the first eight years the forecast produced better estimates than this assumption, but thereafter the projection errors are similar in magnitude. 'Thus as the length of the projection period increased, the forecasting errors increased so much that the errors became as large as would have been obtained if no forecast had been made' (p. 271).

Reading 16 You should now read Ahamad's own summary of his work and his conclusions noting particularly his recommendations for improving the planning of teacher supply in future.

9.14 The latest projections of teacher demand and supply made by the Department of Education and Science are based on alternative estimates of the school population, and on alternative assumptions about wastage. The result is that what Ahamad calls the 'false impression of high statistical reliability' has been modified, and uncertainties and the need for flexibility in planning are much more explicitly recognized.

> It is in the nature of all projections of the kind covered in this *Report* that there should be many uncertainties. The pattern described above does not cater for a combination of extreme variations from all the projections of school population, wastage and other factors which reinforce one another by falling in the same direction. However there are in the pattern at least three main elements of flexibility:
>
> i within a training capacity of 60,000 places variations in the make-up could alter output;
>
> ii should the balance of teacher supply and demand differ significantly from that assumed, the closer assimilation of teacher training with the rest of higher and further education, which is now well advanced, with allow for the number of trainee teachers to be varied more readily than in the past;
>
> iii there is a substantial pool of qualified teachers out of service and below retirement age.
>
> These elements would be sufficient to accommodate a wide combination of possibilities of future trends.[50]

Self-assessment Question 5

(i) Suppose that the Council recommended that the average size of class should be reduced by 10 per cent. What effect would this have on the proportion of oversize classes?

(ii) When forecasting supply of teachers in 1956, the Council underestimated wastage and underestimated recruitment. Yet by 1967 the actual supply of teachers was almost exactly what the Council predicted. Why?

(iii) Suppose that in the future, the DES follows Ahamad's advice and makes a range of estimates of demand and supply, based on alternative assumptions. What effect would that have on policy?

10 How useful is manpower forecasting?

10.1 To some extent this catalogue of the problems and difficulties encountered during twenty years of manpower forecasting makes gloomy reading. It certainly provides no encouragement for the belief that it is easy to base the provision of higher education on forecasts of manpower needs. We have seen examples of forecasts that have led to wrong policy decisions, and may actually have contributed to shortages or surpluses of manpower. Does this mean that manpower forecasting should be abandoned?

10.2 The paper started by emphasizing that there is no definitive answer to this question. You have read Blaug, who believes that 'if educational planning is ever to grow up and to become integrated with economic planning, it must repudiate this modern form of crystal-ball gazing'.[51] You have read Parnes, who believes that despite all the difficulties, the likelihood that government decisions on education 'will be enlightened is greater if they are made in the light of a careful analysis of the kind that is described here'.[52] You have read Hollister, who believes that 'in any case estimates of manpower requirements are a necessary part of educational planning and that further research to improve estimation methods is warranted'.[53]

10.3 You should now be in a position to decide for yourself which of these propositions you support. In any case, it is worth remembering that some, at least, of the recommendations of the advocates of manpower forecasting and its critics are similar. Both groups are in favour of (a) increasing the flexibility of the educational system and the labour market; (b) examining carefully the current employment situation, to obtain accurate data on manpower stocks and utilization.

10.4 The differences that remain between the manpower forecasting and the rate-of-return approach cannot be argued away. Ultimately, the differences rest upon attitudes to price (and cost) and to uncertainty. As we have seen in this paper, these differences depend on how one thinks the labour market for educated manpower behaves: for example, how employers choose workers, how wage-rates are determined, whether informal training is a substitute for education, and so on. These questions can only be answered by much more detailed research on the operation of the labour market. Alternative hypotheses about the labour market have been presented under the heading of 'two views of the state of the world'. But these are not the only views that economists hold about the workings of the labour market. A recent theory is that in many cases jobs are distributed by means of an *internal labour market*, that is:

> an administrative unit, such as manufacturing plant, within which the pricing and allocation of labour is governed by a set of administrative rules and procedures. The internal labour market, governed by administrative rules, is to be distinguished from the *external labour market* of conventional economic theory where pricing, allocating and training decisions are controlled by economic variables. These two markets are interconnected, however, and movement between them occurs at certain job classifications that constitute *points of entry and exit* to and from the internal labour market. The remainder of the jobs within the internal market are filled by the promotion or transfer of workers who have already gained entry. Consequently, these jobs are shielded from the *direct* influences of competitive forces in the external market.[54]

This concept is beyond the scope of this paper, but is worth mentioning here as an example of a theory of the labour market different from either of the ones discussed so far. Which of these alternative theories is closer to the truth for Britain, at present, cannot be answered without more research.

10.5 It seems that we need to think again about the questions to ask in manpower and educational planning. If, in the future, manpower forecasting abandoned the assumption of fixed coefficients and explored the implications of alternative patterns of manpower utilization, on the basis of analysis of relative salaries and the relative costs of different types of education, there would be no inconsistencies between manpower forecasting and rate-of-return analysis. Moreover, if, as Hollister suggests, manpower estimates were presented in a way that reflected, rather than attempted to disguise, underlying uncertainties, and if educational and labour-force flexibility were to be given a higher priority in planning, many of the objections that we have examined in this paper would disappear.

10.6 At the same time, advocates of manpower planning argue that rate-of-return analysis should take more explicit account of forecasts of changes in levels of output or patterns of employment. Other economists would argue for more research on the operation of labour markets. There is some evidence that British manpower planning is now moving towards a synthesis of elements of broad category manpower forecasting, combined with analysis of trends in relative wages. A recent paper by the Department of Employment sketches such an approach, but it is still too early to see what results this will have on manpower or educational policy.[55]

To conclude, I will simply try to summarize my own view on how far the manpower-forecasting and cost–benefit approaches are inconsistent, not in the hope that you will necessarily adopt this point of view, but so that you can evaluate it, in the same way as you evaluate all the other arguments for or against manpower forecasting.

10.7 It seems to me that manpower planning, in the sense of analysis of the labour market and of the relationship between education and job skills, combined with policies designed to improve manpower utilization and career choice, is not only perfectly consistent with the view that education is a social and private investment, and that the aim of the policy-maker should be to maximize social returns, but also necessary to ensure the most efficient use of scarce resources. On the other hand types of manpower forecasting that assume rigid relationships between education and occupation, or between manpower and output, and ignore the relative costs of different types of education, are inconsistent with it, and likely to lead to poor policy decisions.

Answers to self-assessment questions

(No answers are provided for the student activities, since the answers are provided in the text, immediately after each activity.)

Self-assessment Question 1

(i) See paragraph 3.3.

(ii) See paragraph 3.5.

(iii) See paragraph 3.7. The second statement is closer to Parnes's view.

Self-assessment Question 2

(i) It depends on the purposes of the forecast. If the planner is interested in broad categories of manpower, and is only concerned with rough orders of magnitude, in order to identify serious shortages or surpluses, then long-term estimates may be sufficient. However, for more detailed planning decisions, accurate forecasts are more important; this question of the time-scale of forecasts is discussed more fully in the set book, pp. 137–45.

(ii) (a) More women may join the labour market.
  (b) Some new graduates may enter employment, rather than go on to postgraduate research.
  (c) General science students may decide to brush up their chemistry and switch subjects before their finals.
  (d) Employers may give on-the-job training to non-graduates.
  (e) Employers may try to reorganize the work, so that one graduate chemist could supervise the work of several technicians.
  (f) Employers may find that physicists could do the job as well as chemists.
  (g) A new machine may make it possible to use the time of chemists more efficiently.

(iii) See paragraph 3.9.

Self-assessment Question 3

(i) In text.

(ii) In text.

(iii) In text.

Self-assessment Question 4

(i)–(v) See paragraph 5.4.

Self-assessment Question 5

(i) The Council assumed that the size of all classes would fall at the same rate as the average size of class, so over-size classes would be reduced by 10 per cent, and the proportion of over-size classes would also fall by 10 per cent.

(ii) Wastage increased at roughly the same rate as recruitment, so that the effect of the two errors was self-cancelling.

(iii) In text.

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1.1 When you started Blocks I and II you briefly considered the 1972 White Paper *Education: a framework for expansion*, and some of the economic problems that were raised, explicitly or implicitly, by the policy discussion in it. In reviewing your work on these first two blocks it may prove helpful to cast your mind back to the discussion of these elements of the 1972 White Paper in the Introduction as a sort of 'sheet-anchor' while we try to align and relate the diverse economic ideas you have studied in Blocks I and II.

Let us briefly review the content of the blocks. It is probably best to do this, not by attempting to list and summarize each of the main topics covered, but rather by following through the main line of argument.

1.2 We started with the problem faced by planners in assessing the desirable future provision of education. In Paper 2 of Block I ('Forecasting the Private Demand for Education') Gordon and Williams essayed a set of workable and coherent distinctions between various concepts used by those who are responsible for trying (for policy purposes) to foresee the educational future—*extrapolations*, *projections*, *forecasts* (conditional or otherwise) and *targets* (paragraphs 2.2–2.10). Even when targets are set any attempt at realizing them must rest, explicitly or implicitly, on one of the preceding types of prediction. Given that, at compulsory levels of education, the size of the relevant age-groups of the population is by far the most important factor determining the scale of *effective demand* for educational places, Gordon and Williams went on to outline, in simplified form, the various *demographic* concepts and techniques that can be used to predict population size (paras 3.1–3.15). But for post-compulsory education, and in particular for higher education, other factors assume a much greater relative importance. Pupils and students, after the minimum school-leaving age, individually and *en masse*, pass through a series of transitions from one educational level to the next. At each stage their decisions whether to go on to the next stage or not, and if so to what type of education, are affected by a whole series of factors. Gordon and Williams attempted to give an idea of the complexity of these, and of the interactions between them, by sketching some of the main attempts during the 1960s in Britain to forecast the demand for places in higher education (paragraphs 5.7 ff.) and the main reasons for error which, in retrospect, could be seen in them. This led them on to set out more generally the problems of building a 'model' to predict future numbers of qualified applicants or entrants to higher education. In any such model the *willingness rate*—the proportion of those qualified for entry who do actually enter—is of crucial importance.

1.3 In Paper 3 of Block I ('Factors influencing the Demand for Higher Education') Gordon and Williams shifted the focus from the 'impersonal' discussion of numbers passing from one level of education to another, to concentrate on the factors that influence (or propel, or determine) the decisions of individual students—factors that thereby affect the 'willingness rate'.

Gordon and Williams explained how it is possible in principle to construct a *demand function* for higher education, explaining the number of higher-education places taken up, in close analogy with the demand function for a more conventional commodity such as beef. Effective demand will depend on the size of the population of potential purchasers (paragraph 2.3), the income of the population (paragraph 2.8), the price of the product (the private costs of higher education) (paragraph 2.9), a whole variety of 'preferences' among the population (paragraph 2.10), and the benefits or returns they expect from taking higher education (such as higher lifetime earnings) (paragraph 2.12). The fact that, even after trying to incorporate all these factors, the architects of a demand function may have left out or not been able to measure some factors that systematically affect demand, means that fitting such a function to empirical data may (and usually will) reveal an additional trend which, by definition, reflects the action of factors not satisfactorily incorporated in the function (paragraph 2.13).

Economists, of course, are most interested in the contribution they can make to understanding the influence of the economic factors. Gordon and Williams end their paper with a very brief assessment of evidence which suggests that economic factors (such as the expected additional income from higher education) do have an identifiable substantial, though almost certainly not dominant, effect on the choices of school-leavers in England and Wales.

1.4 Paper 4 of Block I ('The Individual's Private Investment in Education') and Paper 1 of Block II ('Education as a Social Investment') together form an important link in the argument. Between them they form a bridge between considering the factors affecting educational choice by individuals and the way economists can use this information as one of the conceptual bases for planning future educational provision.

Both papers are concerned with economists' basic techniques of cost-benefit analysis—for bringing into a single measure the overall costs and benefits of decisions, such as decisions to take, or provide, courses of higher education. In the first case (Block I, Paper 4) the situation is considered from the point of view of the individual student, or potential student; and in the second (Block II, Paper 1) from the standpoint of the government, as the provider of public education and as the architect of the state's overall economic and public spending policies.

It is not appropriate here to go over again the detailed problems of defining and measuring private and social costs and benefits, which are the main topics discussed in these papers. If you are still uncertain about the concept of discounting and the rationale of the social rate of return you should turn back to Paper 4, sections 1-3. Here it is important to stress that the connection, within the course, of the content of Block I, Paper 4, with that of Block II, Paper 1, is a close and essential one. Not only is the basic framework for the main cost-benefit measures (the *cost-benefit ratio and the internal rate of return*) which is set out for private costs and benefits by Westoby the *same* framework as the one used by Morris in its application to social costs and benefits; the connection also lies in the fact that the aggregate result of the thousands of individual decisions taken each year by young people to go on to higher education is the provision, by the state, of a massive annual subsidy to 'investment' in the transformation of the skills, and earning power, of a substantial part of the labour force for several decades ahead. And, conversely, the real freedom of most individual students to enrol for higher education, and to choose types of courses, is determined by the scale and type of the state's provision of the resources for public higher education. These two sides of the main coins which jangle in the public educational purse are rightly connected—though only in very general terms—in the paragraph of the 1972 White Paper which was quoted earlier:

> The Government consider higher education valuable for its contribution to the personal development of those who pursue it; at the same time they value its continued expansion as an investment in the nation's human talent in a time of rapid social change and technological development. If these economic, personal and social aims are to be realised, within the limits of available resources and competing priorities, both the purposes and the nature of higher education, in all its diversity, must be critically and realistically examined. The continuously changing relationship between higher education and subsequent employment should be reflected both in the institutions' and in the individuals' choices. The Government hope that those who contemplate entering higher education—and those advising them—will the more carefully examine their motives and their requirements; and be sure that they form their judgment on a realistic assessment of its usefulness to their interests and career intentions (paragraph 117).

If the notion of *discounting*, which was explained with reference to private choices in Paper 4 of Block I, seemed at that stage stretched and artificial, it none the less became clear in Paper 1 of Block II that among the many criteria brought to bear on the continuous modification of public spending policy the *rate of discount* would, of necessity, be a crucial one if any systematic attempt were to be made to set the present costs of higher education against the benefits that will accrue over the subsequent forty years or so.

One of the ideas which is central to the argument of Block II, Paper 1, is that the *marginal productivity* of workers—both those with and without higher education—be taken as the basis for calculations to estimate the social benefits of higher education and, thereby, which (if any) areas in higher education are, from a policy point of view, the most desirable ones to expand.

1.5 Although the estimation of social rates of return is the *main* theoretical economic technique developed in market economies to make effective the approach to higher-education planning which claims that the main social function of higher education is to meet the demands of the labour market, this has not been the chief one used in the past quarter of a century. The various techniques of *manpower planning*, discussed by Woodhall in Paper 2 of Block II ('Manpower Planning and the Demand for Qualified Manpower'), have in fact been much more widely employed.

Again, this is not the place for a recapitulation of the range of types of manpower forecasting and planning which Woodhall describes and analyses—including both those for specialized professions and occupations, and for the labour force as a whole. While the general rationale for manpower forecasts is the same as that for other criteria for planning the provision of higher-education places, their appropriateness is very much a function of the particular case. In summarizing the cases for and against manpower forecasts of all the various types she discussed, she describes Blaug's 'Two Views of the State of the World' (paragraphs 5.6–6.4) and returns to several of the problems and questions raised earlier in Blocks I and II (and in television programme 3). How far are labour markets (or a particular labour market) competitive? May earnings be taken as reflecting marginal social productivities? What forms of prediction, and what methods for the renewal of targets and plans, can best deal with the inevitable presence of uncertainty? How far are different types of skilled labour substitutable with one another and with non-labour imports? Developing the argument further, Woodhall raises—without pretending to be able to answer fully—some of the issues that manpower planners must face if they are to answer the central criticisms made of it. How, for example, can manpower forecasts abandon the (explicit or implicit) assumption of technically fixed coefficients of production? Can they make explicit the uncertainty surrounding their assumptions in such a way as to give a useful idea of the uncertainty of the results? Above all, can they be reformulated in such a way as to take account explicitly of the (average or marginal) social costs of different types of higher education?

In ending on these types of policy issues—implicit in, but not directly addressed by the 1972 White Paper—Woodhall carries us forward to the concerns of the later blocks of the course, especially in so far as they have to do with the overall efficiency of the education system (Blocks III and IV).

1.6 By way of conclusion to these blocks you should note two points.

(i) For the most part, the authors have been concerned with policy issues, case studies, empirical work and examples within higher and other post-compulsory levels of the education system. This emphasis has tended to exclude—or at least place very much in the background—the study of other types of education which cater for larger numbers of people and have more resources devoted to them. If we have concentrated on higher education, one of the main reasons is that it is at the post-compulsory levels that public policy has most latitude to determine the scale and type of provision. Furthermore, it is here that any guidance that the economics of education is able to give can potentially have its most significant influence. Finally, issues which are in any case complex are, we think, somewhat easier to understand if based on the varying educational choice of individual students, which is not so explicit in compulsory education. We are concerned that our examples have been drawn largely from a circumscribed area, but you will find that the emphasis on post-compulsory education in the opening blocks will be rectified, at least to some extent, in the rest of the course.

(ii) The analytic studies and policy problems we have discussed have been almost entirely drawn from the education systems of developed, capitalist economies, principally those of the UK and the USA. By no means all economies are of this type; not all authors would accept the frameworks set out even for economies of this type. Bowles and Gintis, for example, in a recent study, *Schooling in capitalist America* (1976),[56] argue that no proper understanding of the relationships between the education system and the economy is possible without recognizing that:

  (a) differences of income are very heavily influenced by the *system* of power and control relationships within corporate production processes and state bureaucracies, and cannot in a direct way be attributed to the productivities of individual workers; and

  (b) that one of the main functions of the education system is to socialize young people into accepting (or at least acquiescing in) this system of power relationships and that this function, as well as that of providing them with skills used to perform their individual jobs, is an essential part of education's contribution to the twin processes of economic production and the reproduction of the labour force.

We shall not pursue this line of argument here; it has a close relationship with the discussion of education and equality in Block V. Some of the central ideas involved are discussed too in the accompanying radio programme. But what is important to recall is that in selecting issues and examples relevant to planning educational provision in types of society of which present-day Britain is typical, we have unavoidably left out of account *both* social systems which are fundamentally different from those of the UK and the USA, *and* critiques of the educational and economic systems of developed market economies that hold that the most desirable policy is to alter these in more or less radical ways. Part of the task of some of the later radio programmes accompanying the written materials is to supplement the latter in this respect.

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Economics and Education Policy

Course outline

Block I The Planning of Higher Education—the Private Demand

1. Introduction to Blocks I and II by Adam Westoby
2. Forecasting the Private Demand for Education by Alan Gordon and Gareth Williams
3. Factors influencing the Demand for Higher Education by Alan Gordon and Gareth Williams
4. The Individual's Private Investment in Education by Adam Westoby

Block II The Planning of Higher Education—the Social Demand

1. Education as a Social Investment by Vera Morris
2. Manpower Planning and the Demand for Qualified Manpower by Maureen Woodhall
3. Conclusion to Blocks I and II by Adam Westoby

Block III The Internal Efficiency of Education Institutions

1. Introduction to Block III by Leslie Wagner
2. The Measurement of Output by Leslie Wagner
3. Cost Studies and Efficiency by Donald Verry
4. Increasing Education Efficiency: the Role of Educational Technology by Leslie Wagner
5. Financial Incentives and Efficiency in Education by Donald Verry

Block IV The Finance of Education

1. Introduction to Block IV by Leslie Wagner
2. The Existing System of Finance by Howard Glennerster
3. Alternatives in the Finance of Education: Vouchers by Maureen Woodhall

Block V Education, Equity and Income Distribution

1. Introduction to Block V by Vera Morris
2. Education and Income Distribution by Vera Morris
3. Some Distributional and Equity Aspects of the Student Loans Debate by Donald Verry

Accompanying the above blocks in the course are various supplementary material, including offprints of readings, broadcast notes, tutor- and computer-marked assignments, and the *Introduction and Guide to the Course* (prepared by Leslie Wagner) and *Economics and Education Policy: Using the Literature* (prepared by Sheila Dale).